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New Species and Records of Western Orthoptera

(Orthoptera: Tetrigidae; Acrididae; Tettigoniidae; Stenopelmatidae)

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This report is based on collections made primarily by staff members of the Oregon State Department of Agriculture (ODA) and the California Department of Food and Agriculture (CDA). A single record of a pygmy grasshopper is included here because it is the second known specimen of its species. A new band-winged grasshopper is described reinstating *Agymnastus* as a distinct genus.

The Jerusalem cricket described in this paper is of interest because of its endemic distribution in a sand dune system in northern Arizona. Such unique species merit special consideration especially in light of the destruction of dune habitats by off-road vehicles.

The author would like to thank Mr. Kenneth Goeden of the Oregon State Department of Agriculture and Drs. Fred G. Andrews and Alan R. Hardy of the California Department of Food and Agriculture for permitting me to study their material. Carolyn Mullinex is thanked for her illustrations. Figures 21 and 22 were provided by Dr. F. G. Andrews.

Tetrix sierrana Rehn and Grant

Tetrix sierrana Rehn and Grant, 1956, Proc. Acad. Nat. Sci. Phila. 108: 110. Type locality: Sugar Pine, Madera County, California, 4,300-5,000 feet elevation. Holotype female deposited in Academy of Natural Sciences of Philadelphia, number 5,792.

This species has been known only from the holotype. It is distinguished from *T. subulata* (Linnaeus), the only other species in the genus within its range (Rehn and Grant, 1961), by the anterior margin of the carina of the fastigium of the vertex which is interrupted by the median carina. In *T. subulata,* the transverse carina is only slightly in-

terrupted by the median carina. The tegmen is two-thirds or less the length of the middle femur in *T. sierrana* but in *T. subulata* it is as long or longer. Although the author has searched the type locality several times, the species was never located and the type was regarded as an aberrant or mislabelled individual. This record from a locality 20-25 air miles from the type locality provides substantial evidence for the validity of *T. sierrana.* Additional collecting is still necessary to provide males of this elusive little grasshopper.

Record. — CALIFORNIA: Mariposa County: El Portal, 23.VI.1953 (D. Giuliani, 1♀, CAS).

Agymnastus Scudder, **new status**

Agymnastus Scudder, 1897, Canadian Entomol., 29:75. Type of the genus: *Leprus ingens* Scudder, by original designation.

In 1968 Strohecker, Middlekauff and Rentz synonymized *Agymnastus* with *Xanthippus* noting that its generic status was best left to revisionary studies. At the same time *Agymnastus haemopterus* Strohecker was synonymized under *Xanthippus olancha* (Caudell). The synonymy of this species is unquestionable but the status of *Agymnastus* should be changed.

That *Agymnastus* is distinct from *Xanthippus* is apparent from both the type of the genus, *A. ingens,* and *A. venerabilis* Rentz, new species. The two genera are close but separable on the basis of the following: the fastigium of the vertex is always distinctly carinate or rugose in *Agymnastus* but smooth or with only a minute carina in *Xanthippus*; the pronotum is much more tuberculate in *Agymnastus* species than it is in any *Xanthippus* species and the median pronotal carina is less defined than it is in *Agymnastus* species; the internal pagina of the hind femur in *Agymnastus* is jet black, often with a bluish overcast. There are no subapical annuli. This combination of characters is approached in *Xanthippus* only by *X. corallipes pardalinus* and *X. olancha.* The tegminal coloration is different in *Agymnastus* from that of *Xanthippus.* In *Agymnastus* the tegmen is either concolorous dark brown or with a few obscure blotches. In *Xanthippus* the tegmen is usually marbled or speckled, never concolorous. The wing disc color in *Agymnastus* is always opaque and bright yellow. In *Xanthippus* this color can be yellow, orange, red, or various shades of pink. The two genera seem to be distinct with respect to the phallic complex although Barnum (1959) has shown this can be quite uniform in oedipodines. The epiphallus of *Agymnastus* is smoothly rounded at the base of the posterior projections. In *Xanthippus corallipes* (type of *Xanthippus*) and several other species which I have examined, there is a broad raised area with acute projections on each side. The lophi in *Agymnastus* are stout and gracefully incurved with apices rather blunt. In *Xanthippus* the lophi are twisted and the apices are acute. In *X. corallipes* the dorsal valves of the aedeagus are acute; in

Agymnastus they are blunt.

Agymnastus species may prefer a different habitat or feed on different host plants from *Xanthippus* species because I know of no records of both genera occurring sympatrically. A close relative, the ubiquitous *Cratypedes neglectus* (Thomas), is, however, sympatric with species of both genera.

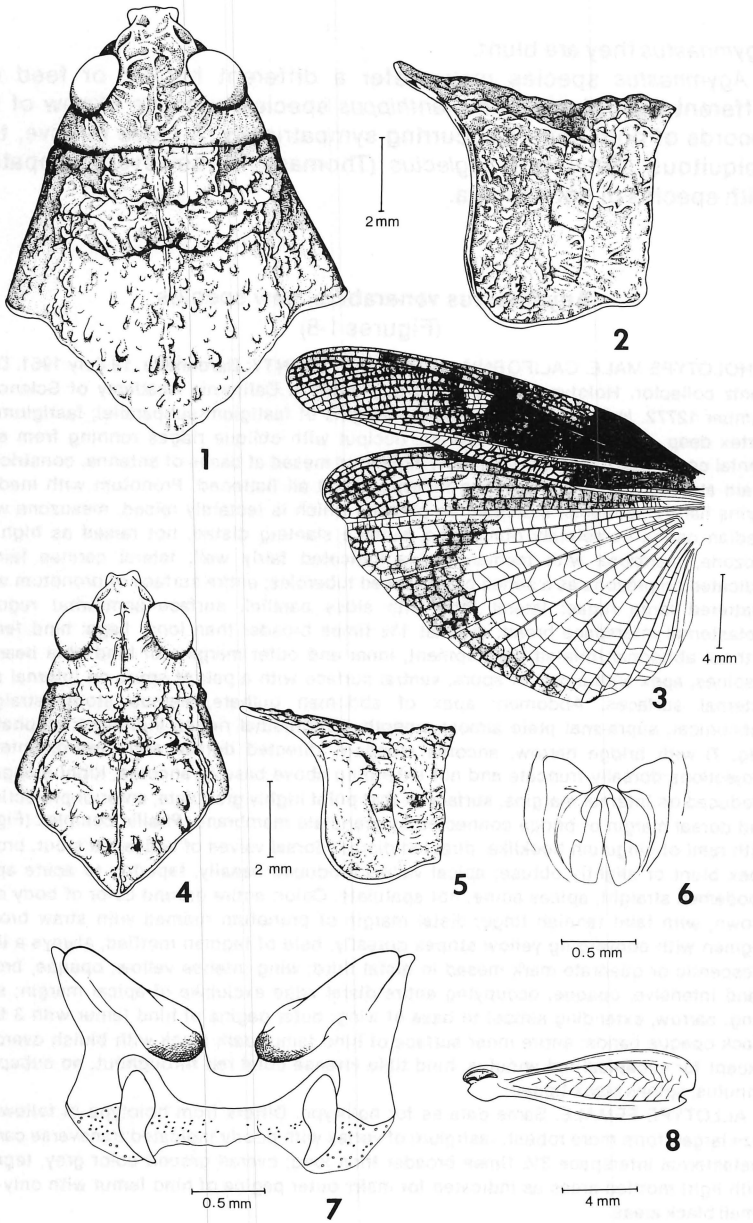
Agymnastus venerabilis, new species
(Figures 1-8)

HOLOTYPE MALE. CALIFORNIA: TUOLUMNE COUNTY: Dardanelle, 19 July 1961. D.C. Rentz collector. Holotype and allotype deposited in California Academy of Sciences, number 12772. Head highly rugose with margins of fastigium subparallel; fastigium of vertex deep, with short median carina; occiput with oblique ridges running from eye; frontal costa deep, narrowed dorsally, expanded mesad at bases of antenna, constricted again at base; eye small; antenna filiform, not at all flattened. Pronotum with median carina hardly definable, indicated on prozona which is tectately raised, mesozona with median carina completely obliterated, surface slanting distad, not raised as high as prozona, metazona with median carina indicated fairly well; lateral carinae faintly indicated on prozona as a series of coalesced tubercles; entire surface of pronotum with scattered large rugae; lateral lobe with sides parallel, surface somewhat rugose, metasternal interspace broad, at least 1½ times broader than long. Legs: hind femur without abnormal inflated development, inner and outer margins of hind tibia bearing 9 spines, apex with a pair of spurs, ventral surface with a pair of spurs on internal and external surfaces. Abdomen: apex of abdomen bulbate, cercus stout, straight, subconical, supra-anal plate almost smooth, longitudinal ridges indistinct; epiphallus (Fig. 7) with bridge narrow, ancorae elongate, directed dorsad and inward, anterior projections dorsally truncate and not extending above base of ancorae; lophi elongate, produced on internal margins, surface at that point highly granulate, anterior projections and dorsal margin of bridge connected by granulate membrane. Phallic complex (Fig. 6) with rami of cingulum hooklike, directed distad; dorsal valves of aedeagus stout, broad, apex blunt or slightly obtuse; apical valves produced basally, tapering to acute apex; apodemes straight, apices acute, not spatulate. Color: entire ground color of body dark brown, with faint tannish tinge; distal margin of pronotum rimmed with straw brown; tegmen with converging yellow stripes dorsally; field of tegmen mottled, always a light crescentic or quadrate mark mesad in distal third; wing intense yellow, opaque, brown band intensive, opaque, occupying entire distal edge exclusive of apical margin; spur long, narrow, extending almost to base of wing; outer pagina of hind femur with 3 faint black opaque bands; entire inner surface of hind femur dark black with bluish overcast except for subapical red annulus; hind tibia intense coral red throughout, no subapical annulus, spines black-tipped.

ALLOTYPE FEMALE. Same data as for holotype. Differs from holotype in following: size larger, form more robust; fastigium of vertex with poorly indicated transverse carina; metasternal interspace 3½ times broader than long; overall ground color grey, tegmen with light mottled areas as indicated for male; outer pagina of hind femur with only two small black areas.

Derivation of name. — This species is named after its importance in recognition of *Agymnastus* as a distinctive generic unit.

Variation. — Topotypes are variable to some extent in the rugulosity of the head and pronotum and coloration. Some males have the tegmina immaculate dark brown except for the dorsal stripes and light median mark. The tannish overcast of the type is overshadowed by the dark brown of darker specimens. The coral red color of the hind tibia is faintly present on both the fore and middle tibia of one of the topotypic males.



Figs. 1-8. Taxonomic characters in *Agymnastus venerabilis* Rentz, new species. Fig. 1. Head, pronotum, allotype female. Fig. 2. Lateral view pronotum, allotype female. Fig. 3. Left tegmen and wing, paratopotype male. Fig. 4. Holotype male, head and pronotum. Fig. 5. Holotype male, pronotum, lateral view. Fig. 6. Aedeagus. Fig. 7. Epiphallus, paratopotype male. Fig. 8. Hind femur holotype male.

	Sex	Length Body	Length Pronotum	Width Prono-tum	Length Hind Femur	Width Hind Femur	Length Tegmen
Holotype	♂	24.6	6.0	4.7	13.2	3.9	23.5
Allotype	♀	39.3	8.3	6.3	16.4	5.3	26.0
Paratopotype	♂	22.3	5.5	4.0	11.8	3.5	22.0
Carrville	♀	35.5	8.4	6.3	15.7	5.3	26.8
"	♀	35.3	8.8	6.5	16.6	5.5	28.8
"	♂	22.3	5.4	3.7	12.1	3.5	24.5
Big Bend Mtn.	♂	25.0	6.5	4.3	12.2	3.9	23.7
Iceberg Mdw.	♂	24.9	6.4	4.5	12.0	3.6	23.5
North Fork	♀	36.5	9.5	7.2	18.0	5.8	30.3
West Point	♀	33.9	10.0	6.6	17.2	5.8	29.9

Table 1. Measurements in mm of specimens of *Agymnastus venerabilis* n.sp.

Records. — CALIFORNIA, BUTTE COUNTY: Big Bend Mountain, 23.V.1928 (H.H. Keifer, 1♂, CDA). CALVERAS COUNTY: West Point, 8.VIII.1929 (--, 1♀, CAS). MADERA COUNTY: Trinity County; Carrville, 29-VI-1913, 30.V.1934, 30.V.1935, 23.VI.1931 (E.C. Van Dyke, 1♂, 3♀, CAS). North Fork, 11.VI.1933 (R.P. Allen, 1♀, CAS). TUOLUMNE COUNTY: Dardanelle, 19.VII.1961 (D.C. Rentz, holotype, allotype, 1♂, CAS). Iceberg Meadow, 7,000 ft. elev., 27.VI.1961 (M. Lundgren, 1♂, DCR).

Diagnosis. — Differs from *A. ingens* by its more slender appearance, smaller size, more rugose head and pronotum and less "inflated" outer face of the hind femur. Females are much less robust than those of *A. ingens* and are fully capable of flight.

Discussion. — *A. venerabilis* was found along Highway 108 in grassy meadows among giant granite boulders. The exact locality is along the Stanislaus River. *Cratypedes neglectus* (Thomas) was taken at the same time and could be confused with this species unless carefully examined. Field separation of the two species may be made by the color of the inner face of the hind femur. *C. neglectus* never has the internal surface black with a bluish overcast. Instead, it is brown and there are two straw brown annuli. Females of *A. venerabilis* are fully capable of flight and do so without hesitation. This is in contrast to the more coastal *A. ingens* (Scudder) which is totally flightless in that sex.

I have an additional undescribed species of *Agymnastus* before me from the California Academy of Sciences collection labelled "Siskiyou County, Cal." It is part of the A. Koebele collection. Because the specimens lack specific locality data, Koebele collection material sometimes bears questionable data, and the three specimens are females, they are not being described at this time. They are immediately recognizable as members of *Agymnastus* by the characters noted above. The species is more robust than *A. venerabilis* and females seem capable of flight. The tegmen is colored

as described for the type of *A. venerabilis*. The hind tibia, however, is yellow and the internal surface of the hind femur is black with a subapical yellowish annulus.

Idiostatus Pictet

Idiostatus Pictet, 1888, Mem. Soc. Phys. Hist. Nat. Geneva, 30:63. Type of the genus: *Idiostatus californicus* Pictet, by monotypy.

Rentz revised this genus in 1973 and later Rentz and Lightfoot (1976) added a new species from Oregon and provided additional notes. Subsequently, Mr. Kenneth Goeden of the Oregon State Department of Agriculture submitted for identification an additional undescribed species of *Idiostatus* (in the Apollo Group) from Oregon. His collection also included specimens of *I. apollo* Rentz and extends the known range of that species into southern Oregon.

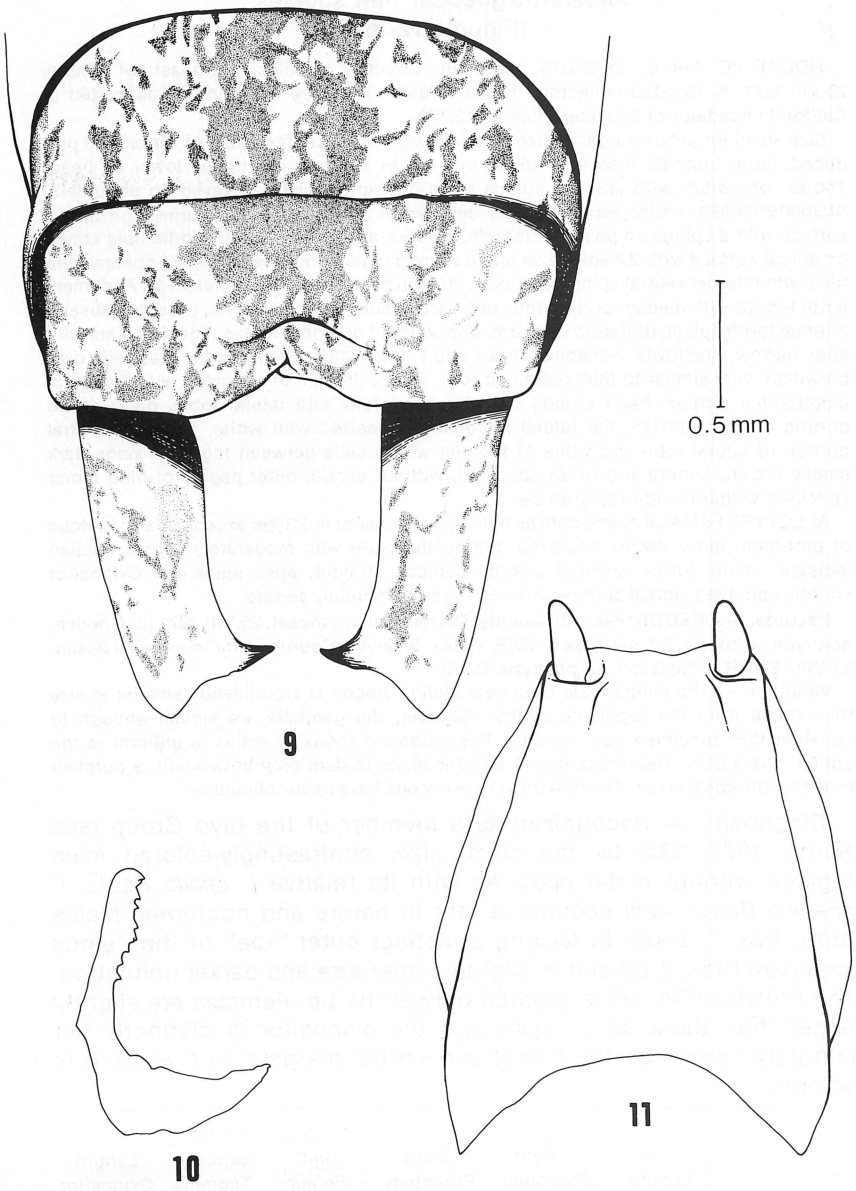
Mr. Goeden's collection notes indicate that both species, *I. apollo* and *I. goedeni*, new species, are rare in nature and could be easily overlooked because of their small size. There is also some suggestion that these species occur late in the year and are not present in consecutive years at a given locality. Many miles of night driving and searching were required before the small series was secured.

Idiostatus apollo Rentz
(Figures 9-11)

Idiostatus apollo Rentz, 1973, Mem. Amer. Entomol. Soc., 29&136. Type locality: 7-9 miles East of Cedarville on Highway 299, 4,700 ft. elev., Modoc County, California. Holotype deposited in California Academy of Sciences, number 10,491.

This rare species was described from northeastern California with records from north of Reno to northwest Nevada, adjacent to its distribution in California. The records presented here extend the range of the diminutive species considerably. The record from Abert Lake region is of interest because the author visited the area in September 1968 and did not find the species. The area was also searched in 1974 and 1975 by D.C. Lightfoot while studying and collecting *I. chewaucan* Rentz and Lightfoot but no *I. apollo* were ever found. The tendency for desert-inhabiting *Idiostatus* species to not be found in consecutive years in certain localities is repeated over and over again (see Rentz, 1973, Rentz, and Lightfoot, 1976). *I. apollo* is apparently such a species.

Records. — OREGON: Lake County: Adel, 6 miles east, 14.VIII. 1974 (K. Goeden, 2♂, ODA). Abert Lake, north end, junction highway 395 and Paisly road, 2.VIII.1976 (K. Goeden, 1♂, last instar 1♀, ODA).



Figs. 9-11. Diagnostic structures in *Idiostatus apollo* Rentz, all drawn from male, 6 mi. E. Adel, Oregon. Fig. 9. Apex of abdomen, male. Fig. 10. Right arm titillator. Fig. 11. Subgenital plate.

Idiostatus goedeni, new species
(Figures 12-16)

HOLOTYPE MALE. OREGON: Klamath County: 4 miles northeast of Olene, 25.VIII.1971. K. Goeden collector. "In sagebrush". Holotype and allotype deposited in California Academy of Sciences, number 12,773.

Size small for genus, larger in size than *I. apollo*. Head with fastigium of vertex well produced, more truncate than in *I. apollo*; eye not as bulging, positioned lower on head. Thorax: pronotum with anterior sulcus more distinct, heavily engraved on shoulders, obsolete mesad; metazona with slight depression mesad. Fore tibia armed on dorsal surface with 2 spines on posterior margin, anterior margin unspined; middle tibia armed on dorsal surface with 2,3 spines on anterior margin, posterior margin with 4 spines; hind tibia with internal ventral apical spur long, three-quarters length of metatarsus. Abdomen: tenth tergite with median portion inflexed; cercus subquadrate in form, outer toe absent, internal tooth apical; titillators with arm long, without distinct teeth; subgenital plate with apex narrow, shallowly V-shaped, styles short. Coloration: ground color basically dark brownish, very similar to that described for *I. apollo*; dorsum of abdomen with 3 distinct longitudinal stripes; head striped dorsally, pronotum with lateral lobes dark, dorsal portion of disc pinkish, the lateral margins emphasized with white, posterior ventral portion of lateral lobe and veins of tegmen white; cells between tegminal veins dark smoky brown; femora and tibiae speckled, without annuli; outer pagina of hind femur speckled, without longitudinal stripe.

ALLOTYPE FEMALE. Same data as holotype. Similar to holotype except anterior sulcus of pronotum more deeply engraved. Subgenital plate with moderately narrow median incision, lateral lobes rounded; cercus conical, straight, apex subacute. Ovipositor slightly upcurved, dorsal surface with cutting edge minutely serrate.

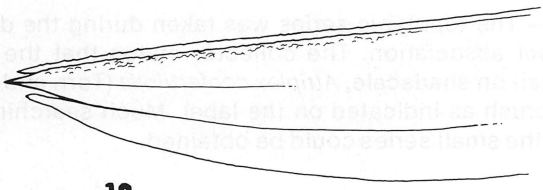
Records. — OREGON: Klamath County: Olene, 4 mi. northeast, 25.VIII.1971 (K. Goeden, holotype, allotype, 2♂ paratypes, CAS, ODA). Siskiyou County: 4 mi. southeast Malin, 21.VIII.1970 (R.L. Westcott, 1♂ paratype, ODA).

Variation. — The single male from near Malin, Oregon is significantly smaller in size than those from the topotypic series. However, the genitalia are similar enough to consider this specimen as *I. goedeni*. The topotypic series of males is uniform in the critical characters. The coloration of all specimens is dark grey brown with a purplish broad longitudinal stripe. No light brown specimens have been collected.

Diagnosis. — Recognized as a member of the Inyo Group (see Rentz, 1973: 134) by the small size, contrastingly-colored male tegmen without distal spot. As with its relative *I. apollo* Rentz, *I. goedeni* Rentz, new species is rare in nature and nocturnal. Males differ from *I. apollo* in lacking a distinct outer "toe" of the cercus (compare Figs. 9,15) and in slightly larger size and darker coloration. The titillator (Fig. 16) is toothed only at the tip. Females are slightly larger than those of *I. apollo* and the ovipositor is distinctly but minutely serrate on the dorsal and ventral margins. In *I. apollo* it is smooth.

	Total Length	Length Pronotum	Width Pronotum	Length Hind Femur	Length Exposed Tegmina	Length Ovipositor
Holotype	16.2	4.2	2.8	14.1	2.3	
Allotype	18.0	4.9	2.6	17.6		14.2

Table 2. Measurement in mm of specimens of *Idiostatus goedeni* n.sp.



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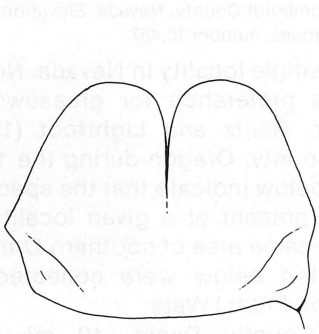

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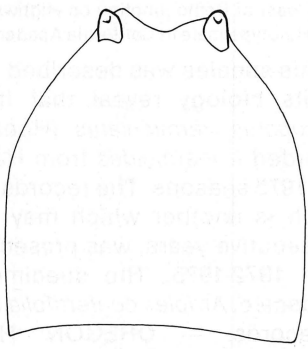

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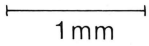

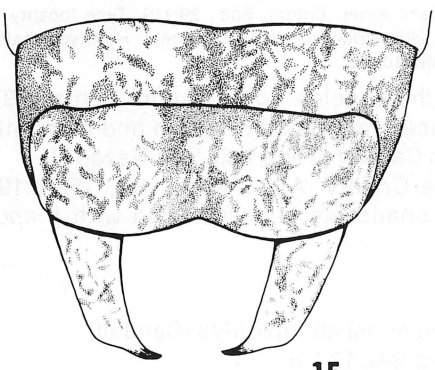

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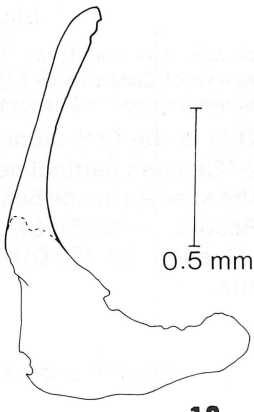

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Figs. 12-16. Diagnostic structures in *Idiostatus goedeni*, new species. Fig. 12. Ovipositor, allotype female. Fig. 13. Subgenital plate, allotype female. Fig. 14. Subgenital plate, holotype male. Fig. 15. Apex of abdomen, holotype male. Fig. 16. Right portion of titillator, holotype male.

Discussion. — The topotypic series was taken during the day in a sagebrush-juniper association. The collector states that the series was actually taken on shadscale, *Atriplex confertifolia* (Torr. and Frem.) Wats. not sagebrush as indicated on the label. Much searching was required before the small series could be obtained.

Idiostatus inermoides Rentz

Idiostatus inermoides Rentz, 1973, Mem. Amer. Entomol. Soc., 29:77. Type locality: 1.5-4.5 miles west of Denio junction on Highway 140, Humboldt County, Nevada. Elevation 1460 feet. Holotype male in California Academy of Sciences, number 10,487.

This species was described from a single locality in Nevada. Notes on its biology reveal that it has a preference for greasewood, *Sarcobatus vermiculatus* (Hook.) Torr. Rentz and Lightfoot (1976) recorded *I. inermoides* from Harney County, Oregon during the 1974 and 1975 seasons. The records listed below indicate that the species, which is another which may not be present at a given locality in consecutive years, was present in the same area of southern Oregon from 1972-1975. The specimens listed below were collected in shadscale, *Atriplex confertifolia* (Torr. and Frem.) Wats.

Records. — OREGON: Harney County: Denio, 10 mi. NE, 15.VIII.1972 (K. Goeden, 1♂, 1♀, CDA). Fields, 12 mi. S. 15,VIII.1973 (K. Goeden, 1♂, ODA).

Idiostatus martinellii Rentz

Idiostatus martinellii Rentz, 1973, Mem. Amer. Entom. Soc., 29:119. Type locality: 7-9 miles east of Cedarville on Highway 299, Modoc County, California. Holotype male in California Academy of Sciences, number 10,489.

This is the first record of the species from Oregon. Rentz, (1973: 122-123) cites particulars concerning the distribution and bionomics of the species in northeastern California and adjacent Nevada.

Record. — OREGON, Lake County: Adel, 10 mi. SE, 15.VII.1976 (K. Goeden, 3♂ 1♀, ODA), in shadscale in association with *I. apollo* Rentz.

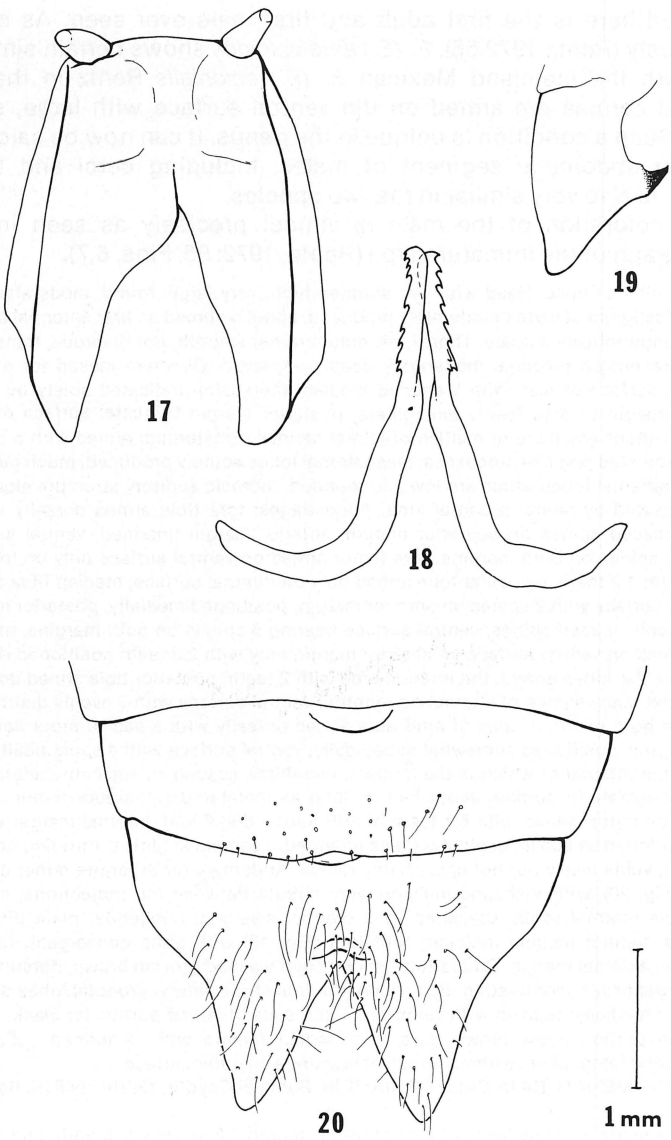
Eremopedes (Eremopedes) ateloploides (Caudell) (Figures 17-20)

Stipator ateloploides Caudell, 1907, Proc. U.S. Nat. Mus., 32:350. Type locality: San Jose del Cabo, Baja California, Mexico. Holotype female, last instar, deposited in U.S. National Museum, number 10,172.

Pediodectes ateloploides, Rehn and Hebard, 1916, Trans. Amer. Entomol. Soc., 42:45.

Eremopedes (Eremopedes) ateloploides, Rentz, 1972, Proc. Acad, Nat. Sci. Phila., 124:55.

This species was described from a last nymphal instar female and has been known only from immature specimens. The specimen



Figs. 17-20. Diagnostic structures of male *Eremopedes (E.) atelo-ploides* Caudell. Fig. 17. Subgenital plate. Fig. 18. Titillator. Fig. 19. Left cercus. Fig. 20. Apex of abdomen, cerci hidden.

reported here is the first adult and first male ever seen. As noted previously (Rentz 1972:55), *E. (E.) anteloploides* shows certain similarities with the mainland Mexican *E. (E.) colonialis* Rentz in that all femoral carinae are armed on the ventral surface with large, stout teeth. Such a condition is unique in the genus. It can now be said that the last abdominal segment of males, including cerci and tenth tergite, is also very similar in the two species.

The coloration of the male is almost precisely as seen in the photograph of the immature type (Rentz, 1972: 55, Figs. 6,7).

Description of male. Head with eye situated high, very large, round, moderately protruding; fastigium of vertex moderately produced, about as broad as first antennal article, weakly longitudinally sulcate. Thorax: pronotum rather smooth, not glabrous, transverse sulcus present on prozona, moderately deeply engraved. Obsolete mesad for a short distance; surface of disc with V-shaped median impression indicated solely by color; anterior margin of disc feebly emarginate, posterior margin truncate; surface of disc entirely without any trace of median or lateral carinae. Prosternum armed with a pair of widely separated peg-like processes; mesosternal lobes acutely produced, much more so than metasternal lobes which are low and rounded; thoracic auditory structure elongate, half concealed by lateral pronotal lobe. Appendages: fore tibia armed dorsally with 3 equally spaced spines on posterior margin, anterior margin unarmed, ventral surface bearing 6 spines on both margins; fore femur armed on ventral surface only on internal margin with 1,2 teeth, genicular lobe armed only on internal surface; median tibia armed on dorsal surface with 2 spines on anterior margin, positioned medially, posterior margin with 4 evenly spaced spines, ventral surface bearing 6 spines on both margins; median femur armed on ventral surface on anterior margin only with 2,3 teeth positioned distad, both genicular lobes armed, the internal lobe with 2 teeth; posterior tibia armed dorsally with a great many spines of alternating lengths, ventral surface with 7 evenly distributed spines on both margins; apex of hind tibia armed dorsally with a pair of stout spurs of equal lengths, positioned somewhat subapically, ventral surface with 4 spurs positioned apically, the internal of which is the longest, two-thirds as long as adjacent metatarsus; plantula quadrate in outline, about half as long as metatarsus; posterior femur armed ventrally on outer margin with 5,7 teeth distributed in distal half, internal margin with 5 teeth positioned as above, genicular lobes unarmed. Tegmina slightly protruding beyond pronotum, veins heavy but not appreciably raised. Abdomen: tenth tergite rather deeply incised (Fig. 20), with V-shaped incision, very hirsute between the projections; cercus with single internal tooth, preceded by a distinct swelling; subgenital plate (Fig. 17) without a distinct median incision; titillators (Fig. 18) with arms convergent, heavily toothed on external margin. Coloration: ground color washed greyish brown, dorsum with broad lighter brown, contrasting median longitudinal stripe; lateral pronotal lobes darker, intensified medially; tegmen with veins very light, cells of lateral portion jet black, those of median portion straw brown; fore and median femora with ill-defined subapical annulus, hind femur plain, without annuli or markings on outer surface.

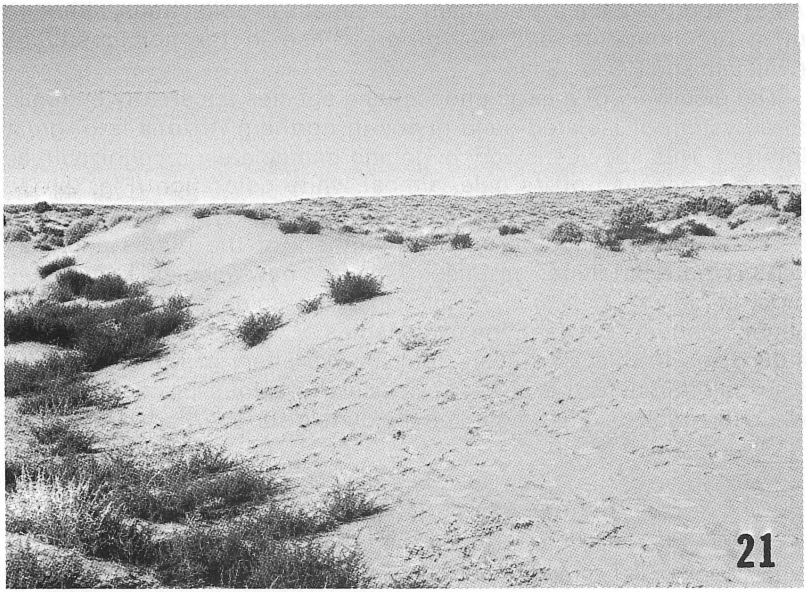
Record. — MEXICO, BAJA CALIFORNIA: SUR, Bahia El Coyote, 12.VIII.1968 (R. Bandar, 1♂, CAS).

Measurements. — Total length 25.0; pronotum, length 7.0, width 4.5; length hind femur 18.9.

Stenopelmatus Burmeister

Stenopelmatus Burmeister, 1838, Handbuch der Entomologie, 2:720.

Jerusalem crickets of the genus *Stenopelmatus* attract attention wherever they occur because of their size and ferocious appearance.



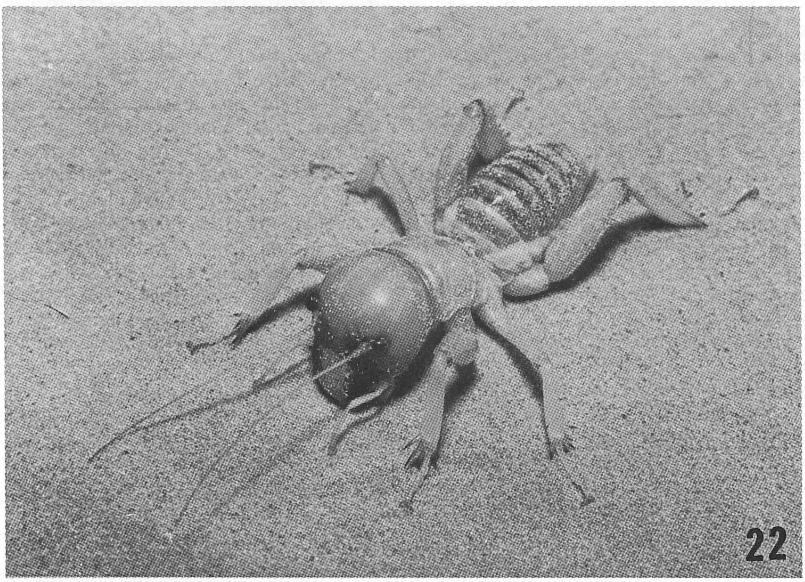


Fig. 21. Moenkopi dunes, habitat of *Stenopelmatus navajo*, new species. Fig. 22. Living male, *S. navajo*.

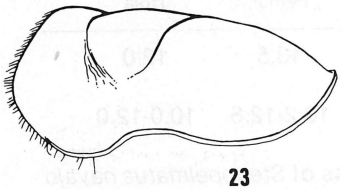
As a result there are a great many specimens in collections, although most are immature and not of great use in taxonomic studies (Tinkham and Rentz 1969).

The discovery of a large undescribed species apparently endemic to a system of isolated sand dunes in northern Arizona is of great interest. This species is very large and immediately recognizable as different because of its pale, almost white coloration (Fig. 22). *S. fuscus* (Haldeman), the widespread species typically found in northern Arizona, occurs on the periphery of the dunes and may venture onto the dunes at times. *S. navajo,* new species, is probably most closely related to *S. fuscus* since the spination of the legs is almost identical between the two species. *S. navajo* is larger than any individuals of *S. fuscus* seen from the periphery of the dunes. The pale coloration of the new species is of obvious protective value when the crickets are foraging on the dune's surface.

Stenopelmatus navajo, new species
(Figures 21-30)

HOLOTYPE MALE. ARIZONA: Coconino County: 3.1 miles southwest of Moenkopi, 17 July 1975. F.G. Andrews, A.R. Hardy collectors. Holotype, in alcohol, deposited in California Academy of Sciences, number 12,775 through courtesy of California State Department of Food and Agriculture. Head megacephalic, depth of head from occiput to apex of mandibles (16.5 mm), greatest width of head (13.0). Eye inverted pyriform, prominent. Thorax: pronotum ampliate forward, lateral margins broadened at ventral projecting edge; in lateral profile, pronotum not appearing especially humped, anterior suture marked; anterior margin of pronotum emarginate, fringed with decurved hairs, posterior margin obtuse. Abdomen: supra-anal plate minute, triangulate (Fig. 25), uncinate hooks prominent at lateral bases; cercus erect, pubescent, cylindrical; subgenital plate (Fig. 24) with apex broad, truncate, with minute median projection. Legs: forelegs with femur in lateral profile with upper margin arcuate, ventral margin straight; fore tibia unspined dorsally, apical calcars typical, 3 inner long, 2 outer short, dorsal external the shortest; ventral surface of fore tibia with 2 staggered apical calcars, distal one slightly longer. Middle femur typical; middle tibia with 5 calcars, much smaller than those of fore tibia, preceded by a single spine of similar size situated mesad on dorsal surface; ventral surface with a pair of subapical spurs positioned at base of calcars III and IV. Hind legs typical in form; hind tibia with 6 apical calcars increasing in size gradually from outer-external to innermost calcar; dorsal surface with 3 outer stout spines, 5 inner spines much more widely spaced, the first placed beyond middle of tibia; number II calcar subequal to number III but same length as number I; ventral surface of tibia with a pair of subapical spines, the innermost much the longer, situated opposite calcars III and IV. Setation: vestiture sparse, hind tibia with a row of close-set setae on dorsal margin of outer surface, the ventral margin of internal surface with similar row of setae; outer surface of hind femur with a row of widely spaced setae on dorsal margin, ventral margin

Figs. 23-30. Diagnostic structures in holotype male *Stenopelmatus navajo* new species. Fig. 23. Lateral view pronotum. Fig. 24. Subgenital plate. Fig. 25. Apex of abdomen. Fig. 26. Lateral view apex of abdomen. Fig. 27. Head. Fig. 28. Right hind tibia. Fig. 29. Middle tibia. Fig. 30. Fore tibia.



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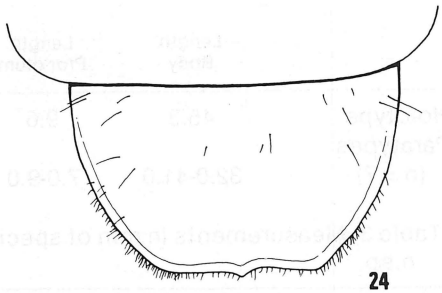

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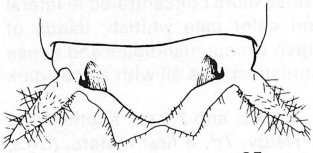

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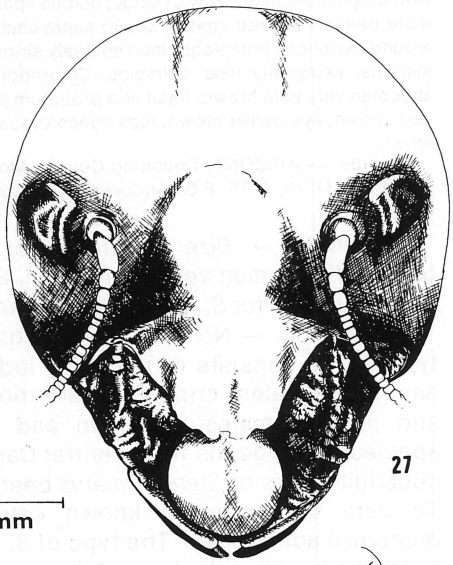

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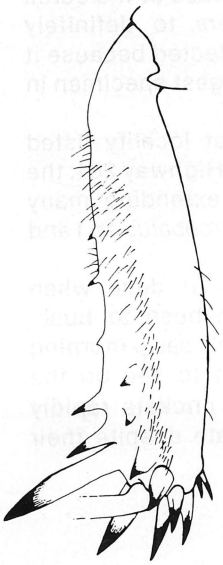

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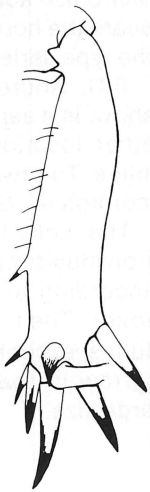

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	Length Body	Length Pronotum	Length Hind Femur	Length Hind Tibia
Holotype	45.3	9.6	13.5	12.0
Paratypes (n = 7)	32.0-41.0	7.0-9.0	10.2-12.8	10.0-12.0

Table 3. Measurements in mm of specimens of *Stenopelmatus navajo* n.sp.

with much more dense row of setae; cercus sparsely setose, inner surface with a shorter, more densely packed coat of setae; supra-anal plate with 10 elongate setae positioned around periphery; entire abdomen sparsely setose, the setae more concentrated at lateral margins, especially near spiracles. Coloration: ground color pale whitish; bands of abdomen very pale brown; head and pronotum pale whitish except mandibles and genae dark brown; eye darker brown; legs concolorous pale whitish, spines all with apices dark brown.

Records. — ARIZONA: Coconino County: Moenkopi, 2.4 mi., and 7.6 mi. southeast, 3 July 1972, 17.VII, 1975, F.G. Andrews, E.A. Kane, A.R. Hardy, 7♂, 3 first instars, (CAS, CDA).

Diagnosis. — Size very large for genus. Ground color whitish, bands of abdomen very pale brown. Spination of legs very similar to that described for *S. fuscus* (Haldeman) in Tinkham and Rentz (1969).

Discussion. — No adult females have been discovered. The entire type series consists of males as indicated above. Such is unusual among Jerusalem crickets where most collections contain females and juvenile males, (Tinkham and Rentz 1969). Experience with species in the genus from central California indicates that adult and subadult males of *Stenopelmatus* bear hooks at the base of the cerci. To date there are no known external characters to definitely recognize adult males. The type of *S. navajo* was selected because it bears the hooks at the base of the cerci and is the largest specimen in the type series.

F.G. Andrews (pers. comm.) states that the first locality listed above is a sand ridge running north and south along Highway 264; the other locations are an immense sand dune area extending many miles. The two dominant shrubs are greasewood (*Sarcobatus* sp.) and mormon tea (*Ephedra* sp.).

The activity of the Jerusalem crickets begins at dusk when individuals can be seen searching the sand from bush to bush. According to Andrews, this activity extends into the early morning hours. Their pale coloration renders them difficult to see on the dunes except when moving. When disturbed, the crickets rapidly burrow in the sand where they are difficult to locate despite their large size.

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Zoological Nomenclature Announcement A.N. (S.) 105

The required six months' notice is given of the possible use of plenary powers by the International Commission on Zoological Nomenclature in connection with the following names listed by case number: (see *Bull. Zool. Nom.* 34, part 4, 28 February, 1978).

Opinion No.

1237 CARABIDAE (Coleoptera), proposals concerning the names of four Linnean species.

Comments should be sent in duplicate (if possible within six months of the date of publication of this notice in *Bull. Zool. Nom.* 34, part 4), citing case number to:

R.V. Melville,
The Secretary,
International Commission on Zoological Nomenclature,
c/o British Museum (Natural History),
Cromwell Road,
LONDON, SW7 5BD,
England.

Those received early enough will be published in the Bulletin of Zoological Nomenclature.

A Study of Stylopization in the Bee Genus *Dufourea*

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and

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Strepsipteran parasites of the bee genus *Dufourea* Lepeletier have been known from very few reported cases. Bohart (1941) described *Eurystylops desertorum* from a small series of females extracted from *Dufourea boregoensis* (Michener) collected near Indio, California. Bohart (1943) described *E. tetonensis* from a small series of females extracted from *Dufourea maura* (Cresson) collected in Grand Teton National Park, Wyoming. The third species known was described by Hofeneder (1949) as *E. oenipontana* based on two females taken from *Dufourea inermis* (Nylander) collected in Innsbruck, Austria. A fourth *Eurystylops* was extracted from two species of *Conanthalictus* collected in Andreas Canyon, Riverside County, California. It was named *conanthalicti* by Kinzelback (1971).

The writers in June and July, 1962, located two areas at about 6,300 feet elevation in the central Sierra Nevada Mountains of California where *Dufourea trochantera* G. Bohart was plentiful and showed abundant evidence of stylopization by a new species described herein as *Eurystylops sierrensis* by the senior author. The two areas in question were a semi-arid edge of a meadow at the University of California Sagehen Creek Project, 12 miles north of Truckee in Nevada County (Station I) and a similar meadow margin 2.3 miles west of Highway 89 on the Independence Lake Road some 30 miles north of Truckee in Sierra County (Station II). No nesting sites of the bee hosts were found at the Sagehen locality, but a large nesting colony was observed at Station II. Bees at both sites were visiting dense low-growing masses of *Phacelia humilis* T. and G.

Parasitized *D. trochantera* are not readily detected by the casual observer because the exserted cephalothorax of the *Eurystylops* is obscured by abdominal hair bands on the dorsum of the bee. However, stylopized specimens have the pygidium mostly hidden and dull, the general color browner, and the abdomen somewhat bloated.

Parasitized female *D. trochantera* do not regularly collect pollen. In the 1962 study, tabulations were made on the number of females carrying pollen on the legs. At Station 1, 284 females were examined

The Pan-Pacific Entomologist 54:98-102. April 1978.

and 12.7 percent of them were unstylopized and without pollen, 59.5 percent were unstylopized and bore pollen, 27.4 percent were stylopized and without pollen, and 0.4 percent (one stylopized bee with a light amount of pollen on the abdomen) bore a trace of pollen. Similarly, in 1962 at Station II, 289 female bees were examined and 15.5 percent were unstylopized and without pollen, 39.1 percent were unstylopized and bore pollen, and 45.4 percent were stylopized and without pollen.

Collecting at Station I encompassed four days from June 29 through July 2, 1962 and eight days from June 19 through July 10, 1964. Bees were netted at random near midday, on or about the patches of *Phacelia.* Out of a total of 681 bees, 307 were males and 374 were females. Of the males 4.9 percent were parasitized, 4.3 percent of these being monostylopized (13 bees), 0.3 percent were distylopized (1 bee), and 0.3 percent were tristylopized (1 bee). Of the females 29.8 percent were parasitized, with a percentage breakdown of 24.9 with one parasite (93 bees), 4.1 with two (15 bees), and 0.8 with three (3 bees).

At Station II collecting encompassed two days, July 6 and 7, 1962, and two days, July 8 and 10, 1964. A total of 632 bees were netted, of which eight were males and 624 were females. The female bees were 41.8 percent parasitized (261 bees) probably the highest rate ever reported for bees of any sort. The percentage of females bearing one, two, three or four *Eurystylops* were 31.7 (198 bees), 8.8 (55 bees), 1.1 (seven bees), and 0.2 (one bee) respectively.

When comparing the two years it is apparent that we collected later in the season in 1962 than in 1964. The numbers of male bees collected at Station I dropped sharply after June 29, 1964, and that was our starting reference for 1962. By the first of July, 1964, the females were being collected in greater quantity than were the males, whereas before that date, the reverse was true. Although several males were collected after July 1, 1964, none were parasitized, whereas many of the females were. Perhaps the males bearing parasites die sooner, leaving by July 1 a predominantly parasite-free male population; but the females with their extra stores of food are able to survive for longer periods even though parasitized.

During two days of collecting at Station II in 1962 a phenomenal 45.4 percent parasitization of female bees was recorded (290 total female bees). Two years later, with a considerably larger sample (334 female bees) a somewhat lower percentage was noted: 38.6. In both years males were very scarce at Station II, correlating well with time of year.

Altogether, 1,313 *D. trochantera* were examined at the two stations. Of these, 388 bore parasites and multiple parasitism occurred in 83 of the bees giving a total of 483 *Eurystylops.* This was an excellent opportunity to observe the position of the parasites as indicated by

the location of the exserted cephalothorax of the female *Eurystylops.* As in other stylopids on bees the female parasite rides upside down and backwards with its head protruding through the intersegmental membrane between abdominal terga of the host. In 305 monostylopized bees the parasite was always under apparent tergum IV. The position was lateral but with no obvious choice between right or left side. The 71 distylopized bees had parasites nearly always under apparent tergum IV, one on each side. One bee had a parasite under tergum IV and another under III but on opposite sides. In 11 tristylopized bees, seven had two parasites under IV and one under III, two had all three parasites under IV, and two had one parasite under IV and two under III. In the only quadristylopized specimen captured there were two parasites under IV and two under III. These data show a clear preference for a position under apparent tergum IV with a second choice under III.

It seems likely that parthenogenesis occurs in *E. sierrensis* and possibly within the entire genus. In the five described species only females are known. This is quite unlike the situation in *Stylops* which parasitize *Andrena.* An example of the latter is *Stylops pacifica* Bohart, studied by Linsley and MacSwain (1957). The bee hosts of this species bear male pupae or empty pupal cases (exuviae). In the two year period of their study, 1954 and 1956, the total number of *Andrena caerulea Smith (=A. complexa* Viereck) examined was 4,473 of which 476 were stylopized. Female *Stylops* constituted 60.5 percent and males 39.5 percent. They stated that "the sex ratio of *S. pacifica* is probably one to one" (Linsley and MacSwain, 1957:408). In our study 1,313 *Dufourea trochantera* were examined and 388 of these bore 483 parasites, all female *Eurystylops.*

In the halictid, *Lasioglossum zephyrum*, male parasites of *Halictoxenos jonesi* Pierce occur throughout the summer according to Batra (1965). However, male parasites are most common in August and September. Since the populations of *Dufourea trochantera* which we studied are one-brooded, the presence of male parasites in a second brood can be discounted. Also, there is a possibility that males may occur but kill the host bee as it emerges. No evidence of this sort has been reported for any strepsipteran. There is also the outside chance that male parasites may attack some other insect host, perhaps not even a bee. Although this is not known in Stylopidae, it does occur in the strepsipteran family Myrmecolacidae. Males of this tropical group parasitize ants while females attack Orthoptera.

Linsley and MacSwain, (1957) stated that the aedeagus of the male *Stylops* penetrates and broadly ruptures the membrane of the entrance to the median brood canal. Several specimens of *Stylops* spp. from *Andrena* spp. were examined and compared with specimens of *Eurystylops sierrensis* in *Dufourea trochantera.* No rupturing could be

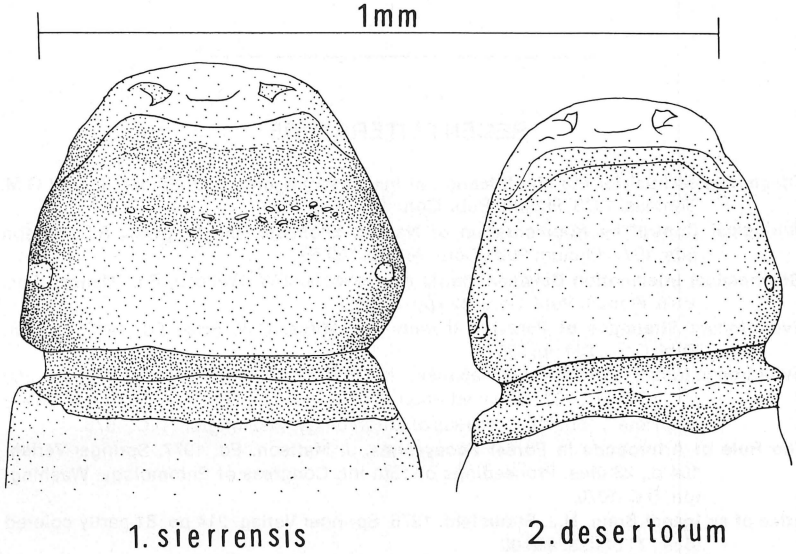
seen in the membrane of *E. sierrensis* where the outer lip of the brood canal was smooth and continuous. On the contrary, the *Stylops* had the outer lip somewhat jagged and there was evidence of punctures in more than one place. These observations point toward parthenogenesis in *Eurystylops.*

Eurystylops sierrensis Bohart, new species
(Fig. 1)

Female holotype (Univ. Calif. Davis): Head and spiracular areas light, remainder of cephalothorax testaceous, basal band fuscotestaceous. Shape of head and thorax as in Fig. 1; mandible approximately triangular, apical tooth nearly straight; apex of head broad, convex. Thorax with transverse band of about 70 transparent spots just posterior to laterobasal angles of head; with an irregular line of 16 pigmented spots between spiracles; cephalothorax widest just behind spiracles. Cephalothorax in mm:width 0.555, width at base of head 0.465, length 0.380, length to collar 0.340, length to front edge of spiracles 0.295.

Holotype female, Sagehen Creek, Nevada County, California, June 29, 1962, ex *Dufourea trochantera* G. Bohart, on *Phacelia humilis* T. and G. (R. Bohart and M. Irwin). Paratypes, 32 females, same data as holotype but collected from June 24 to July 1; 14 females, Independence Lake Road, Sierra County, California, July 7, 1962, same host and collectors as holotype. Paratypes in collections of U.S. National Museum, California Academy of Sciences, and U.C. Davis.

E. sierrensis is about a fourth larger than *desertorum* (Fig. 2) but is different also in the presence of a transverse band of clear spots just behind the head, and in being more angled behind the spiracles. In



Figs. 1-2. Cephalothoraces of female *Eurystylops,* ventral.

the last two characters it agrees with *tetonensis*. However, it is about a fourth smaller than the latter, and the ratio of head width to cephalothorax width is greater (0.865:0.758). Therefore, the cephalothorax appears to be more compact.

Acknowledgments

We wish to thank F.D. Parker for assistance in collecting at Station I, G.E. Bohart for checking our determination of *Dufourea trochantera*, R.K. Kinzelback for comments on taxonomy of *Eurystylops* after studying our material, and Ms. Katie Bear for the illustrations.

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Notes on the Biology of *Pissodes fasciatus* LeConte and its Insect Associates

(Coleoptera: Curculionidae)

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The genus *Pissodes* includes about 11 species, which are sharply divided into two ecological groups: species that breed in growing terminals and laterals of conifers, and species that breed in boles and stumps of moribund and recently killed conifers (Smith and Sugden, 1969). *Pissodes fasciatus* LeConte belongs to the latter group, breeding in stumps and boles of Douglas-fir, *Pseudotsuga menziesii* (Mirbel) Franco. *Pissodes* is a notably homogeneous group; size and elytral scale patterns are the only external morphological characters that can easily be used to separate *P. fasciatus* from sympatric species such as *P. strobi* (Peck) (= *sitchensis* Hopk.) that destroy terminals of healthy conifers. In its habitat preferences, however, *P. fasciatus* is closely related to Douglas-fir bark beetles, such as *Dendroctonus pseudotsugae* Hopkins and *Hylastes nigrinus* (Mannerheim). The insect associates of *P. fasciatus* reflect both its taxonomic and ecological relationships, some being regularly associated with various species of *Pissodes,* others being regularly associated with bark beetles.

Studies of *Pissodes fasciatus* were undertaken as part of a comprehensive study of the insect fauna of dead Douglas-fir. Most observations on *P. fasciatus* were made in the Cedar River Watershed, Cedar Falls, King Co., Washington. During 1971 trees were cut at monthly intervals and the invading insects were observed and collected. During 1971 through 1976 numerous naturally occuring dead Douglas-fir were examined. Sections of Douglas-fir occupied by *Pissodes* were brought into the laboratory for examination. Insect associates were removed and placed, usually accompanied by a small piece of bark, on a pad of paper toweling in a 100 x 15 mm. Optilux Petri dish. The Petri dishes were kept at room temperature and the paper toweling was moistened with a few drops of water every other day.

Biology

Pissodes fasciatus is very abundant in second growth stands in western Washington, where it breeds in shaded boles and stumps of dead and dying Douglas-fir. Cut or windthrown trees supply most of

The Pan-Pacific Entomologist 54:103-106. April 1978.

the breeding material, but the root crowns of pole-sized suppressed trees are occasionally attacked. *Pissodes fasciatus* also breeds in the stumps of Christmas trees in open plantations, but only when the stumps are heavily shaded by brush. Larvae occur in bark that is about .5 cm to over 2 cm thick.

This habitat of *P. fasciatus* in thicker bark of shaded Douglas-fir seems very similar to the habitats of the bark beetles *Dendroctonus pseudotsugae* and *Hylastes nigrinus. Pissodes fasciatus*, however, prefers a much more humid subcortical environment than that preferred by *D. pseudotsugae*, and it is usually found in bark actually in contact with wet ground, in the moist bark around the root collar or on the underside of the bole of trees lying in very dense shade. It is not unusual to find *D. pseudotsugae* occupying the upper side of the bole of a fallen tree and *P. fasciatus* occupying the lower side. *Hylastes nigrinus* occasionally occurs in root crowns with *P. fasciatus*, but more frequently breeds in buried roots.

The life cycle of *P. fasciatus* in western Washington is partially known. Like adult *Pissodes approximatus* Hopkins (Finnegan, 1958) many adult *P. fasciatus* apparently overwinter and may be seen mating and ovipositing on freshly fallen or cut trees in early spring when the air temperature first reaches 18-20°C. Oviposition continues into August, and there are many overwintering larvae; it is not known when these overwintering larvae emerge. Recently emerged adults probably feed on phloem of healthy trees as do other bole-inhabiting species of *Pissodes* (Finnegan, 1958), but it is not known where this feeding occurs, and there are no reports of damage caused by adult *P. fasciatus.*

Oviposition has been observed on several occasions. The female excavates a niche in the outer bark with her rostrum and deposits one to six oval yellowish eggs about 1.2 mm long. The puncture is partially filled in with particles that could be either frass or bits of wood.

The larvae make galleries in the inner bark parallel to the grain of the wood. The galleries usually do not engrave the surface of the sapwood. The pupal chamber is lined with bits of wood or bark and may be in the bark or in the surface of the sapwood. If the bark is thin, the pupal cell is likely to be in the surface of the sapwood.

Insect Associates

In western Washington *P. fasciatus* is attacked by four parasitoid wasps. Larvae found under particularly thin bark may be attacked by a braconid, *Bracon pini* (Meusebeck) that has an ovipositor about 1.2-1.6 mm long. *Bracon pini* is an external parasitoid and there are usually two or three parasites produced from each host. Larvae under thicker bark are vulnerable to another braconid, *Coeloides brunneri* Viereck, that has an ovipositor 4.5-7 mm long. *Coeloides brunneri* is a solitary

external parasitoid. The population of *C. brunneri* remains at a relatively high level because of the abundance of its primary host, the bark beetle *Dendroctonus pseudotsugae. Coeloides brunneri* is often the most important parasitoid of *P. fasciatus* in thin bark. Under slightly thicker bark *P. fasciatus* larvae remain available to another solitary external parasitoid, *Dolichomitus terebrans nubilipennis* (Viereck), an ichneumonid with an ovipositor 7.8-10.5 mm long. Finally, the braconid *Allodorus crassigaster* (Provancher) avoids the problem of bark thickness by ovipositing in the eggs of its host. The solitary parasitoid larva does not kill its host until the latter is almost mature. Female *A. crassigaster* may be observed waiting a few millimeters from a *P. fasciatus* that is unconcernedly ovipositing; before the weevil has left the scene its eggs are already being attacked by the braconid.

Four additional insects are associated with *P. fasciatus* in western Washington. The lonchaeid, *Lonchaea furnissi* McAlpine, is apparently a scavenger, feeding on dead larvae and pupae of *P. fasciatus.* The dolichopodids, *Medetera vidua* Wheeler and *Medetera arctica* VanDuzee, are predators that attack larvae and probably pupae. Adults of a 2.7 mm staphylinid, *Atheta* sp., have been found in *P. fasciatus* galleries; the role of this species is unknown.

None of these eight species of associates is confined to the galleries of *P. fasciatus. Coeloides brunneri, Lonchaea furnissi, Medetera arctica, M. vidua,* and *Atheta* sp. are all common associates of bark beetles. All these species are found in the galleries of *Dendroctonus pseudotsugae* with the exception of *M. vidua,* which occurs in more humid habitats such as the galleries of *Hylastes nigrinus* in roots (Zethner-Møller and Rudinsky, 1967) or the galleries of *Ips concinnus* in heavily shaded Sitka spruce. *Bracon pini, Dolichomitus terebrans,* and *Allodorus crassigaster* are parasitoids of several species of *Pissodes*, including species that breed in leaders and laterals (Stevenson, 1963; Taylor, 1929; Townes and Townes, 1960). Considering the paramount importance of habitat in the selection of hosts by ichneumonids (Townes, 1960) and braconids (Matthews, 1974), it is probable that the species of *Bracon, Dolichomitus* and *Allodorus* that attack *Pissodes* in the bole and roots of dead trees are in reality sibling species of those that attack *Pissodes* in terminals and leaders of healthy trees.

Acknowledgements

This study was supported by National Science Foundation grant no. GB-20963 to the Coniferous Forest Biome, Ecosystem Analysis Studies, U.S. International Biological Program. Determinations of associates of *P. fasciatus* were made by Dr. Paul Marsh (Braconidae) at the U.S. National Museum, Washington, D.C.; Dr. Fred Harmston (Dolichopodidae) of the U.S. Public Health Service, Ft. Collins,

Colorado; and Dr. J.F. McAlpine (Lonchaeidae) at the Canadian National Museum, Ottawa, Canada.

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New North American Tabanidae (Diptera). XXV. The Genus *Hybomitra* And Some Other New Tabanine Horse Flies in Mexico

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Subsequent to Bellardi's first review (1859) of tabanid species in Mexico, complexity of the fauna there has become apparent, as well as the common ancestral derivation of certain elements in the Tribe Tabanini so recently that attempted groupings within the genus *Tabanus sens. lat.* into separate subgenera or even genera has not been entirely practical (see Fairchild, 1969) as complicating intergradation continues to become evident in the Neotropical Region as a whole. It is, nevertheless, useful systematically in some cases to refer relationships to formerly named groups, such as *Lophotabanus* or *Neotabanus* pending assessment as further biological information among pertinent species accumulates.

Rearing immature stages, which has furnished helpful systematic clues to relationships in the adjacent Nearctic fauna (e.g., Burger, 1975 and other articles on the related Arizona fauna) has still received almost no attention in Mexico, but should be increasingly revealing in the foreseeable future (e.g., Tidwell and Philip, 1977). One tabanine element that has obviously evolved recently in Mexico, is the group of slender-bodied *Tabanus* with unistriate abdominal patterns but varying eye coloration; several of this group are discussed and/or described below. Mexican species of recently separated *Hybomitra*, which has speciated abundantly in temperate and boreal regions of the Northern Hemisphere, are only sparingly represented in north-central Mexico, as also discussed below.

In addition to standard metric abbreviations, others used in text include: altitude - alt., highways - hwys., California Academy of Sciences - CAS, Universities of California at Berkeley, (or) Davis - UC Berkeley, (or) Davis, Canadian National Collection, Ottawa - CNC, G.B. Fairchild, University of Florida, Gainesville - GBF, and L.L. Pechuman, Cornell University, Ithaca, New York - LLP. Specimens formerly published as in collection of the author, "CBP" (or so indicated to donors of duplicated material), have now been incorporated into the collection of CAS.

Tabanus arnaudi, new species

Figure 1

Diagnosis: A rather small brownish-red species with brown and gray-lined scutum and distinct (though more reduced than usual in the "*Lophotabanus* group") blackish scutellar-

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prescutellar "eye spot," mid-row of low to tall, almost equilateral gray triangles on chocolate- to red-brown, slender abdomen darkened caudally, reddish antennal plate and 2 hind pairs of legs, and subhyaline wing with normal venation, no spur vein.

Holotype female, length 11.5 mm. Eyes bare, purple with 2 median green bands (relaxed). Frons buff-gray pollinose with darker shadows and patch of black hairs but no tubercle at vertex, sides gently narrowed below, index 1/5.0; callosity dark brown, a little taller than broad, narrowly separated from eye margins, and rapidly tapered above into a strong median keel which is flanked by a median patch of evanescent, dusky pollen. Subcallus pale yellow pollinose. Face and cheeks whitish pollinose and pilose below. Scape pale pinkish yellow with pale hairs grading to brown above, about equal in height to base of plate, the latter dull red, dorsally subrectangulate, and distinctly longer than tall and than darkened style. Apical palpal segment (hereinafter often referred to as Palpus II) yellowish with pale and a few black hairs, slender and blunt apically.

Scutum dark brown with 2 admedian, gray, pale-haired stripes which together in certain lights form a pale longitudinal mid-stripe in front of the black prescutellum; lateral notal margins also gray. In caudal view, a reduced, basal scutellar spot recedes, leaving hind margin broadly pinkish gray, and shaggy pale-haired. Pleura and coxae gray-white pollinose and pilose. Fore legs with tibiae reddish, pale-haired on about basal halves otherwise black. Two hind pairs of legs reddish with indefinite darker shades basally on femora; hind tibial fringes mostly pale-haired basally.

Abdomen dorsally, light chocolate brown, darkening caudally on the last 3 tergites; dark-haired except for pale yellow hairs on gray median triangles, none of which clearly crosses respective tergites, though those on tergites 2 and 3 have faint, attenuated apical extensions; scattered yellow hairs laterally. Venter pale orange yellow, yellow-haired, also darkened caudally.

Type locality: Mexico: Chiapas, N slope Cerro Bola, N Cerro Tres Picos, 1524-2134 m alt., 5.V.72. D.E. Breedlove. In CAS, Ent. Type No. 11722.

Paratype females: 17, same data as holotype; 10, Chiapas-Oaxaca border, Municipio de Cintalapa, 38 km W Las Cruces, 1372 m alt., 13.V.72. D.E. Breedlove; 5, Chiapas, 61 km W San Cristobal jnc. hwys. 190-195., 12.V.59. H.J. Teskey. In colls. CAS, CNC, GBF, and LLP.

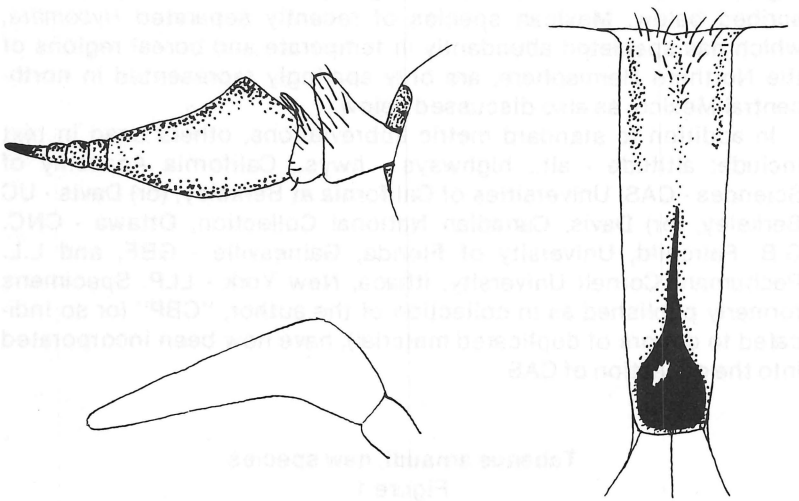

Figure 1. *Tabanus arnaudi* new species, female. Outlines of frons, antenna and palpus.

Except for darkened apical annuli, antennae may be entirely red; abdomen sometimes darkened, or more reddened basally, and a few of the Cerro Bola series contain dried blood which the collector reported was probably obtained from range cattle in the vicinity; the flies were netted while they attacked the field party. In a few specimens, the triangles cross some tergites. Frontal indexes vary from 1/4.4-5.3 and body lengths from 11 to 13 mm. Wear may accentuate the red scutellar margins and decrease the prominence of the prescutellar "eye-spots." The thoracic stripes and generally smaller size distinguish this from related species, such as *T. nebulosus* DeGeer from Central America, which furthermore has chunkier palpi and sublateral abdominal spots. *T. yucatanus* Townsend is another small brownish species from the Yucatan Peninsula which lacks the distinct thoracic lines; the abdominal pattern is trivittate with white-haired triangles and sublateral spots; it has no prescutellar-basal scutellar black-haired "eye-spot," and has more excised antennal plates with sharper baso-dorsal teeth. The types in CAS prompt me to dedicate this nice species to Dr. Paul H. Arnaud, Jr., Chairman of the Entomology Department (CAS), whose cordial provision of facilities for my studies on Mexican and other Tabanidae is gratefully acknowledged.

Tabanus glaucomaculis, new species
Figure 2

Diagnosis: Somewhat like *T. glauconotatus* Philip, this is a medium-sized, blackish fly with gray-lined scutum and 3 rows of prominent, steel gray abdominal triangles. The antenna and fore femur are dark brown to blackish, scape somewhat swollen, wing lightly tinted with faint clouds on crossveins, halter blackish with strongly pale-seamed knob.

Holotype female, length 15.5 mm. Eyes bare, each with a strong, median purple stripe, the lower border indefinitely coppery, upper border greenish (relaxed). Frons gray pollinose with nearly parallel sides, index 1/3.8, and sparse black hairs, a small, non-elevated dark spot at vertex; callosity shining black, touching eyes at lower corners, abruptly tapered into a strong, black median keel nearly to vertex. Subcallus, face and cheeks steel-gray pollinose with white pile below; no lateral subcallar hairs. Scape rather swollen, gray black with black hairs, a little taller than the black, obtuse-angled plate which is distinctly longer, but a little less tall, than length of the black style. Palpus II robust basally, a little shorter than proboscis, blue gray, predominantly black-haired.

Thorax, including prealar lobes and scutellum, black with gray bloom and obscure pale-haired lines dorsally, and whitish pleural and coxal pile. Scutellum with pale hairs on outer corners and a peculiar, central triangle of pale hairs making a suggestion of an unusual geminate black figure on the disc, easily obliterated by wear. Fore tibia basally and 2 hind pairs of legs reddish brown with mixed white and some black hairs, the hind tibial fringe black: fore tibia black on distal half. Wing, including costal cell, subhyaline, cloud on fork and crossveins hardly discernable except to accentuate the veins; venation normal, no spur vein.

Abdomen elongated, a third longer than head and thorax together, but not markedly tapered, tergite 7 only moderately narrower than 6. Pattern basically black-haired; median triangles nearly equilateral with apexes just or not quite reaching anterior tergal margins; sublateral spots rhomboidal on first 3 tergites, rounded thereafter and, in some lights,

isolated from both margins; pale pattern whitish-haired, including narrow incisures. Venter entirely dark gray pollinose with pale hairs, accentuated on incisures, some coarse black hairs caudally.

Type locality: Mexico: Nuevo Leon, Chippinque Mesa, Monterey, 26.VIII.60. H.F. Howden. In CNC No. 12923. Paratypes - 2 females, same data. In colls. CNC and CAS. In close agreement with the type, but some characters less well preserved.

The bluish-gray pattern has considerable resemblance to *T. glaucoconotatus* Philip from Toluca, D.F., which, however, is smaller, less elongate, has smaller, more isolated callosity, a distinctly notched vertex, more plainly bicolored legs, whitish opaque, lower squamae, and the median row of truncated triangles continuous, thus dividing the submedian row of paired dark dashes. The scape of *T. glaucomaculus* is a little more swollen, but not as much as in related *T. abditus* Philip which has not been taken south of Arizona at present; the eyes of the latter are unbanded, and red under the lateral spots is more evident. The pattern in *T. pruinosus* Bigot is more reduced and all sublateral spots isolated. Taken at the same time with the *glaucomaculis* types was a female of casually, morphologically-similar *T. cazieri* Philip female, which, however, is much browner overall, particularly the scutellum and venter.

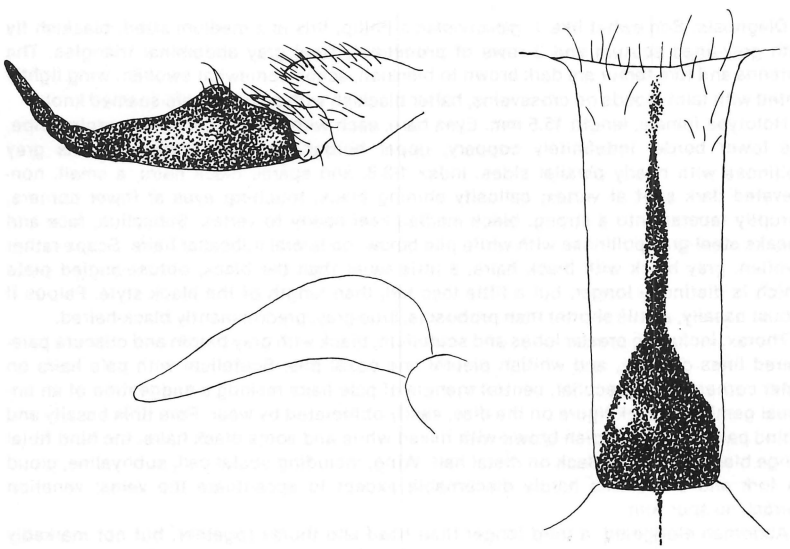

Figure 2. *Tabanus glaucomaculis* new species, female. Outlines of frons, antenna and palpus.

Tabanus rallus, new species
Figure 3

Diagnosis: A small reddish-brown species with entirely red antennae, black scutum and scutellum, midabdominal row of tall, white-haired triangles, and clear wing.

Holotype female, length, 12 mm. Eyes bare, purple with 2 green bands (relaxed). Frons buff gray, slightly narrowed below, index 1/5.2; paler gray pollinose toward the vertex in certain lights; callosity deep blackish brown, barely separated from eyes below and abruptly tapered into a stout median line to the upper third of frons. Subcallus and upper cheeks buff pollinose; lower cheeks and face whitish pollinose and pilose. Antenna brick-red, style a little darker, scape black-haired, subequal to plate in height; latter subrectangulate dorsally and but little longer than style. Palpus II dusky yellow, mostly black-haired, and somewhat thickened at knee, blunt apically.

Scutum black with suggestions of faint gray lines anteriorly and reddish shades on discs of prealar lobes. Pleura and fore coxae gray pollinose and white pilose. Fore leg otherwise black with concolorous hairs; basal third of tibia reddish with pale hairs; 2 hind pairs reddish with pale hairs, basal two-thirds of femora with brown shadings, hind tibial fringe mostly black. Wing glass clear, costal cell faintly yellow, venation normal without spur vein. Halter with brown stem, orange knob.

Abdomen light reddish brown on basal 4 segments above and below, remaining 3 black, black-haired dorsally, pale-haired below; a continuous dorsal row of tall, easily-worn, whitish-haired, truncated triangles which are not expanded along the incisures, a small, elongate dark integumental spot beneath that on t. 2.

Type locality: Mexico: Oaxaca, "42 m St. (?S) Oaxaca," 13.VII.52.945 m. No collector. In coll. L.L. Pechuman.

Allotype male, length 11.5 mm. Except for usual sexual differences, like the female and readily associated. Eyes bare, facets gradually, moderately enlarged in about upper half. Black median spots on first 2 tergites larger than in female, and nearly reaching hind margin of t. 2. Palpus II pallid, ovoid, with mixed black and pale hairs. Mexico: Michoacan,

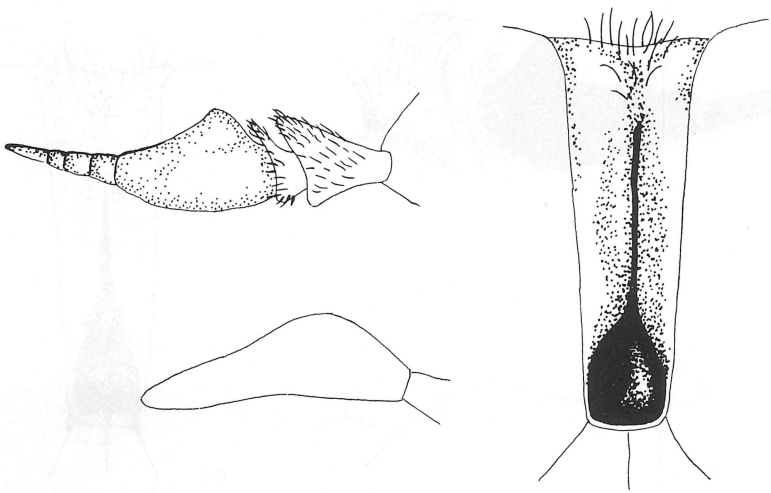

Figure 3. *Tabanus rallus* new species, female. Outlines of frons, antenna and palpus.

13 km N Cuatro Caminos, 300 m. 29.VI.75. E.M. Fisher, in CAS, Ent. Type No. 13103. Another male, same state and collector, 30.5 km S Uruapan, 945 m alt., is omitted from type series because headless. It agrees otherwise with the allotype. These and many other tabanids from southern North America were generously donated by Mr. Fisher of Long Beach State University to CAS.

Paratype female, also Oaxaca, 3 km NW Totalapan, 945 m alt., 7.VII.53 (no collector). In CAS. Differs in only minor respects; 11 mm. Frontal index 1/5.7; tergite 3 partially black behind.

Distinguished among other, slender, unistriate Mexican species by its smaller size, all-red antennae and narrow, less prominent, pale-haired, midabdominal line.

Tabanus searsi, new species
Figure 4

Diagnosis: A medium-large, reddish-brown species with elongated abdomen and single row of white-haired triangles, rather plainly lined scutums and indefinite blackish spot basally on reddish scutellum, black flagellum, faintly tinted wing, and fore tibia darkened only on about distal third.

Holotype female, length, 18 mm. Eyes bare, purple, each with 2 green bands narrower than the median purple interval. Frons pale buff pollinose, slightly widened above, index 1/5.3, callosity reddish brown, narrowly separated from eye margins, double-notched on lower margin, and tapered into a narrow median, bare ridge half way to vertex which is flanked in certain lights by a pair of evanescent brown lines. Subcallus pale buff pollinose. Face and cheeks whitish pollinose and pilose below. Antenna with basal 2 segments pale reddish, scape swollen dorso-apically with black hairs, height subequal to length and to basal height of plate; latter strongly excised, the tooth acute angulate,

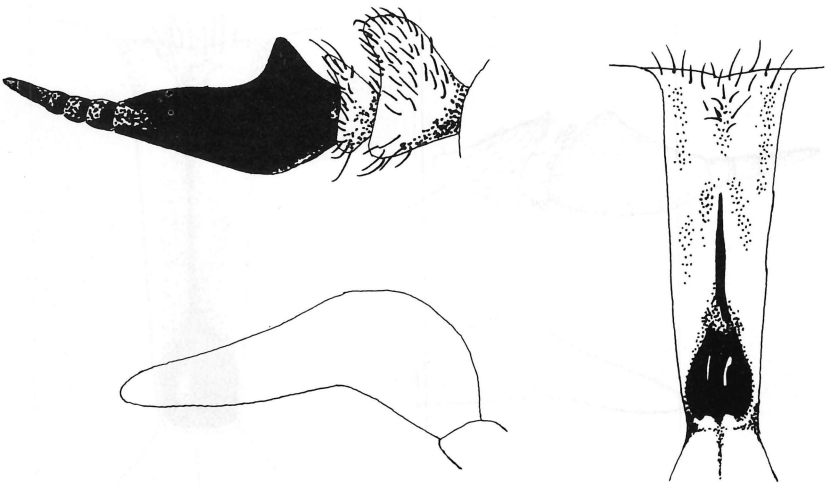

Figure 4. *Tabanus searsi* new species, female. Outlines of frons, antenna and palpus.

mostly black and longer than height, or than style. Palpus II rather slender, pale reddish, nearly as long as unsheathed stylets, tapered to a blunt apex, and with mixed short black and pale hairs.

Thorax reddish brown with 2 submedian and 2 sublateral, darker scutal stripes, the sublateral brown intervals accentuated behind by coarse, easily-denuded pale hairs; prescutellum, and red scutellum basally, dull black, but not sufficiently contrasting for assignment to group *"Lophotabanus."* Legs reddish, mostly pale-haired; fore femur and apical third of fore tibia blackish gray, hind tibial fringe pale. Wing venation normal, no spur vein. Halter yellow.

Abdomen reddish brown, darkening caudally, last two segments black, mostly black-haired dorsally, entirely pale ventrally; pale hairs on edges of tergites, widened on hind corners but not extended along incisures to connect with tall, median, white-haired triangles on tergites 2 to 5, which only just cross tergites 2-3, but are nearly equilateral and shorter on 4 and 5; tergites 6 and 7 black except for a few pale hairs in the middle.

Type locality: Mexico: Chihuahua, Temoris, 1.VIII. 69. T.A. Sears (to whom the species is dedicated), R.C. Gardner, and C.S. Glaser. In UC, Davis, Type No. 441.

Paratype female, same data except 2.1VII.69. in CAS. In good agreement with type, but a recent (dried) blood meal has caused abdomen to appear darker, more tapered and narrower caudally.

This has obvious recent ancestral derivation in common with the smaller *T. arnaudi* new species from Chiapas, which, however, has more reddish, less excised plates, and fore tibiae hardly one-half pale basally. In *T. subfemoralis* new species from the West Coast, the mid-abdominal triangles are yellow-haired and less contrasting, plates more reddish and thoraxes not as plainly lined, in addition to green, only unibanded eyes.

Tabanus subfemoralis, new species
Figure 5

Diagnosis: An elongate species with scutums blackish, antennal flagellum and abdomen predominantly reddish brown, last 2 to 3 segments sharply black and midstripe composed of tall, yellow-haired, truncated triangles, plus less distinct, pale yellow, sublateral spots; legs bicolored.

Holotype female, length, 14.5 mm. Eyes bare, green, each with one purple band (relaxed). Frons buff-gray pollinose, with patch of black bristles in a distinct though low notch at vertex; nearly parallel-sided, index 1/4.3; callosity brown, narrowly separated from eye margins and rapidly tapered into a narrow median brown keel which extends over half way to vertex; lower margin with 2 small sublateral notches. Subcallus also buff-gray pollinose. Face and cheeks whitish pollinose and pilose below. Antenna mostly red, scape moderately swollen with black hairs above, plate brick-red, strongly excavated, dorso-basal tooth prominent, acute-angulate, grading to dark brown on style. Palpus II pale yellow, mostly black-haired, slender, a little thickened basally, blunt apically.

Scutum including scutellum dull black, with appressed yellow and some sparse black hairs but no plain lines, pleura and coxae gray pollinose and whitish pilose. Fore femur and apical three-fourths of tibia black and mostly black-haired, latter lasally red with pale hairs. Two hind pairs of legs red with pale hairs, basal two-thirds of femora and tips of tibiae and tarsi blackish; hind tibial fringes mostly black with some pale hairs basally. Wing lightly tinted, but accentuated along vein R_{2+3}. No spur vein. Halter with brown stem, yellow knob. Basicosta setulose.

Abdomen bright reddish, mostly black-haired above, pale yellow-haired below and on a conspicuous middorsal line of tall, truncated triangles which cross tergites 2 to 5, and with more obscure, yellow-haired rhomboidal, sublateral spots; last 2 segments sharply

black with a reduced median patch of pale hairs on t. 6.

Allotype male, length, 13 mm. Eyes bare, facets only slightly and gradually enlarged in upper halves. Tubercle in occipital notch, small and depressed below eye level. Frontal triangle buff-gray pollinose, darker in apex. Face and cheeks gray pollinose and whitish pilose. Palpus II pale yellow, a third longer than thick, blunt apically and with a few black hairs among mostly white ones. Abdomen more slender and pointed than in females; wear has nearly obliterated the middorsal pale-haired row of truncated triangles so that a dull blackish, middorsal spot on tergite 2, and black on segments behind the fourth are accentuated. Otherwise in good agreement with the holotype.

Type locality: Holotype, Mexico: Sinaloa, 40 km S Elota, 6.VIII.63. J. Powell. In CAS, Ent. Type No. 11721, on permanent deposit courtesy of UC Berkeley. Allotype: also same state and depository but 8 km N Mazatlan, black light. J.A. Chemsak. Paratype females: 5, same data as holotype, plus 1, same data but 5,VIII, J.A. Chemsak; 1, same data as allotype, plus 19, 22-25.VII.72, black light and Malaise traps. J.A. and M.A. Chemsak, A. and M. Michelbacker; 3, 41.5 km N Pericos, 13.VIII.60. P.H. Arnaud, Jr., E.S. Ross, D.C. Rentz; 10, Mazatlan, "at sea level," 31.VII.-16VIII.64. W.R.M. Mason, J.F. McAlpine, plus 5 others, same area and dates, up to 549 m alt., McAlpine, Mason, Howden and McGuffin; 1, 21 km and 14, 8 km E Villa Union, 26.VII,64, W.J. Gertsch, J.A. Woods. E Concordia, 5.VIII.64. L.A. Kelton; Nayarit - 1, 16 km W Acaponeta, 4.VII.62. Sleeper, Anderson and Somberby. Morelos - 1, 11 km SSW Yautepec, 2.VII.61. *"U Kans. Exped."* Michoacan - 1, 8 km SW Tiquicheo, 427 m alt., 8.VII.70. E. Fisher, P. Sullivan. Guerrero - 1, Acapulco, 4.VII.63. Parker, Stanke; 1, 14.5 km E. Chipaderos, 3.VII.63. Parker, Stanke. In colls. CAS, UC Berkeley and Davis, CNC, USNM, American Museum of Natural History, University of Kansas, GBF and LLP. Lenghts, 13-15 mm.

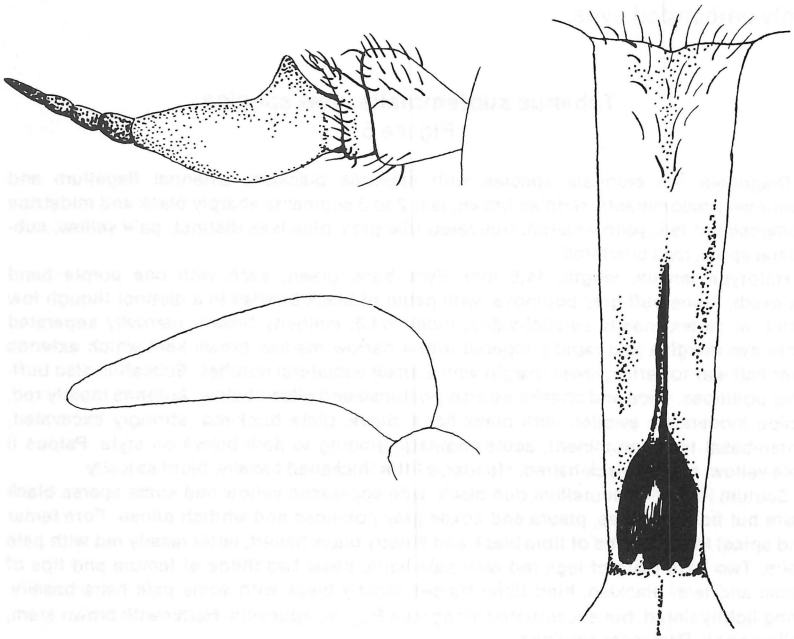

Figure 5. *Tabanus subfemoralis* new species, female. Outlines of frons, antenna and palpus.

Darkening of 2 hind pairs of femora, basally, of tergite 5, and of basal callosity are somewhat variable, and wear may obliterate vague sublateral spots. The black-light captures could indicate either crepuscular habits or attraction from nearby evening perches.

Specimens of related, presumed *T. femoralis* Krober from Guatemala, Honduras and Chiapas differ in fronts being a little narrower (about 1/5), scutums more brownish, eyes purple with 2 green bands, antennal plates more excised and darkened beyond the basal tooth, and wings with brown-margined veins. *T. tumiscapens* Philip also occurs along the western coast of Mexico and has unibanded eyes, but is quickly differentiated from *T. subfemoralis* by the more enlarged antennal scapes and browner abdomens with whitish middorsal stripes. *T. nondescriptus* Fairchild from Darien, Panama, and Columbia, has some resemblance to *T. subfemoralis* but is more brownish overall, including thorax, femora and tinted wings, and the median triangles are more slender and attenuated apically.

Tabanus tumiscapens Philip

Originally described from Nayarit (23 May), specimens have since been seen from Puebla (12 August), Michoacan, and Guerrero; most in June and early July, and up to 1100 m alt. A male was taken with 3 females in Puebla and is described below as the neallotype by comparison with the females.

Neallotype male, 12.5 mm in length. Eyes bare, the facets moderately enlarged in upper two-thirds. Apical palpal segment subovoid with a blunt, downward-pointed nipple apically, about twice longer than thick. Entire whitish body vestiture shaggier, including that on the middorsal stripe of truncated triangles, and white hairs more evident on sides and incisures of abdomen: a more prominent inverted black integumental triangle crossing first 2 tergites. Black hairs on scutum and scutellum longer, more upright.

Neallotype locality: Mexico: Puebla, 11 km NW Tehuitzingo, 1100 m, 1-2.VII.75 E.M. and J.L. Fisher. In CAS, Ent. Type No. 13108.

Tabanus femoralis Krober

The type female from Guatemala of this rather inadequately described species with broken antennae was a war casualty in Hamburg. Accumulation of a few specimens from Guatemala and Honduras has permitted presumptive recognition, as well as of probable occurrence of *femoralis* in Chiapas, Mexico. The species will be redescribed by Dr. G.B. Fairchild of University of Florida, based on a Neotype he will establish from among a series of 7 females in CAS

taken by Mr. E.M. Fisher near Flores, Guatemala, of which the following is a brief characterization that fits some Chiapas specimens as well.

Diagnosis: A medium-sized, brownish-red, slender species with thorax including prealar lobes cinnamon-brown, and hind margin of scutellum a little more reddish, abdomen elongate, brighter reddish than in related Mexican species with mid-row of tall, pale yellow, truncated triangles on tergites 2 to 6, wings tinted with vein margins darkened apico-costally, and legs mostly reddish, pale-haired, including coxae, the fore femora darker with black hairs. Eyes (relaxed) purple, each with 2 green bands; frons gently convergent below, index about 1/5, vertex moderately depressed; antenna mostly reddish, style black, plate strongly excised, the dorsobasal tooth subrectangulate; palpus rather slender, yellowish with black and some pale hairs.

Material examined: Females: 9, Guatemala; 2, Honduras; Mexico - Chiapas: 2, N Slope Cerro Bola, N Tres Picos, 1524-2134 m alt., 5.V.72. D.E. Breedlove; 1,10 km W San Christobal, jnc. hwys. 190-195, 11.VI.60, light. H.J. Teskey; 1, El Sumidero, 7.VI.69. J.E.H. Martin, and 1, same collector but 12.V.69; 1, border Chlapas-Oaxaca, in pine forest, 13.V.67. Halfter and Reyes. In CAS and CNC.

Separation from related *T. subfemoralis* new species is discussed under that species.

Occasional specimens from Chiapas are now doubtfully referred here which were at first set up as a distinct species because of varyingly prominent suggestions of black-haired, darkened integument in the basal scutellar-prescutellar areas and the lack of pale-haired incisural fringes mentioned originally by Krober. The significance of these differences will have to await interpretation from more adequate material.

Tabanus furunculus Williston

Females now assigned to this rather common "species" from Sinaloa to Chiapas, have shown such variation that they are suspected of representing a composite complex. The paler, more reddish form is represented by the syntype female studied in BM (NH) from "Santiago Yacuintla" in Jalisco in the north with reddish legs, callosity, bases of plates, and scutellar margins, as well as basal abdominal segments without black margins enclosing pale median lines. This paler, reddish form has been taken less frequently than a darker form with above-mentioned parts mostly black as represented by the later-synonymized (Fairchild, 1971) *T. aztecus* Philip. I still doubt this synonymy. The original intention of differentiating the latter from the more reddish syntype of *furunculus* was unfortunately confused by ascribing *in lapsus* the syntype characters of *furunculus* to the very different type of *T. haemagogus* Williston in BM (NH), and studied by me at the same time. Males are infrequent in collections, but so far only a hirsute, dark form, represented by the other syntype in BM (NH) from Guerrero, has been seen. The white hairs on many parts of head and body are longer than on any females seen. The tubercle in occipital notch is small but at eye level, and eyes are bare,

upper facets not greatly enlarged, but line of separation at about lower third is distinct. Palpi are ovoid with slightly downward-pointed, blunt apical nipples. It seems not improbable that rearing and biological studies will eventually enable association of these males with a particular group of females in this complex. None of the females with data duplicated with males, in the few instances seen from Nayarit, Morelos and Guerrero, have shown either the same preponderance of long white body hairs or wide middorsal black band enclosing the median white line.

For practical, referral purposes, the more reddish female syntype discussed above from Jalisco, primarily described by Williston, is herewith designated as lectotype in BMNH. The front is parallel-sided, index 1/3.5, the callosity reddish, quadrate ("quadrilateral"), the 2 hind pairs of legs and hind margin of scutellum red. The first 3 abdominal segments reddish, black-haired except for the white-haired median line, beneath which basally is an obscure dark elongate integumental spot (this becomes accentuated by wear or discoloration).

Lengths of females vary from 10 mm (Guerrero) to 15 mm (Chiapas). Revivable eye patterns show lower borders purple, upper green and a median cross-stripe of each color. While bodies are slender, they are not typically as evenly tapered nor the scapes as swollen as in related *T. tumiscapens* Philip with single eye stripes, which is more restricted on the West Coast.

It is difficult to accept as this species, a series of females from Nayarit with similar appearance, except the abdomens are more strongly tapered and darker above and below. Likewise puzzling are individuals from several localities with middorsal, almost equilateral triangles barely crossing tergites, and with data matching others with more characteristic middorsal lines. Variation is also observed in widths of fronts and shapes of callosities in otherwise inseparable material. For these reasons, I refrain from recognizing the dark *"Aztecus* form" until more information is available on this complex, particularly on critical distribution.

The genus Hybomitra Enderlein in Mexico

To the 5 species of *Hybomitra* now recognized in Mexico and keyed below, may now be added 2 more newly described species. Only one, *H. laticornis* (Hine), overlaps the northern Mexican and southern Nearctic faunas, but Burger (1975) considers that the distinctive immature characters should exclude its assignment to this genus, but it is here retained pending further information.

Another Nearctic species that is a vigorous colonizer and recorded as far south as Brazoria County, Texas (Dr. P.H. Thompson, *in litt.*), *H.*

lasiophthalma (Macquart), I had suggested (1968) might occur in northern Mexico, but is still unrecorded there. Two others, *H. cincta* (Fabricius) and *H. zonalis* (Kirby), occur too far north of the border to make early, meantime unconfirmed, Mexican reports credible. A third, *"T". comastes* Williston (= *captonis* Marten), listed by Townsend (1895), was undoubtedly a misidentification (see Philip, 1975), and speculation as to its identity is useless until more is known about the Baja California tabanid fauna.

The genus is replaced to the south from Central Mexico by *Poecilo-deras* Lutz which lacks the characteristic tubercle at vertex, and has other restrictive differences.

The 2 *Hybomitra* species herein added to the Mexican fauna on basis of their vertical tubercles, have imperceptible eye hairs under low magnification. This character is more evident on most species to the north, but varies in *Hybomitra* as it does in *Tabanus*. The males, when discovered, will probably have more evident hairs on the eyes, but their apparent lack in the present females is not considered to impede their placement in *Hybomitra*.

Key to females of known Mexican Hybomitra species

1. Wings with prominent, isolated clouds; (subcallus bare and shining black) (?Mexico highlands; Nearctic to so.-cent. Texas). . . . . *lasiophthalma* (Macquart)
   Wings hyaline, tinted, or with faint clouds on forks 2
2. Femora dark brown to blackish (2 hind pairs at least basally), tibiae obviously lighter reddish; hind tibial fringes mostly black 3
   Legs, at least the 2 hind pairs, essentially unicolorous; hind tibial fringes at least basally, mostly pale-haired 4
3. Sublateral abdominal spots on predominantly reddish abdomen; plates as wide as long, usually entirely red, the styles sharply black; eyes (relaxed) green with 1 purple stripe and lower border indefinitely purple; subcallus with upright hairs laterally unless worn . . . . . (some *laticornis* (Hine), see coupl. 5)
   Sublateral pale spots on predominantly dark integument; plates narrower, mostly brownish-black; eyes similar, but stripe broader and lower border more sharply purple; subcallus reddish, thinly pollinose or with bare areas, no lateral hairs . . . . . (some *aitkeni* with dark femora, coupl. 8)
4. The fronts moderately narrow, 1/3.5 to 1/4.0 (either 3 rows of gray spots on dark abdomen or subcallus usually with sparse upright hairs laterally) 5
   The fronts wider, about 1/3.0 6

5. Frons 1/4.0; abdomen with 3 rows of prominent greenish-gray spots separated by paired submedian, sickle-shaped, black-haired dashes, pinkish only under the lateral spots on first 2 tergites and first 3 sternites (Mexico, D.F. and Durango) ..... *zancla* Philip

   Frons 1/3.5; abdomen broadly reddish on sides and with less prominent sublateral spots on dorsum and venter (NW Mexico, SW U.S.) ..... *laticornis* (Hine)

6. Midfrontal callus predominantly a linear upward extension of callosity 7

   Midfrontal callus an ovoid expansion, narrowly connected or not to basal callosity 8

7. Frons gently convergent below where filled with red basal callosity; plate shorter than tall and than style (Durango) ..... *howdeni* n.sp.

   Frons parallel-sided and dark brown callosity narrowly separated from eye margins; plate distinctly longer than tall or than style (Chihuahua, Durango) ..... *burgeri* n. sp.

8. Eyes sparsely short-pilose with one accentuated median band in life, the lower border less distinctly also purple; abdomen dark with rather isolated, pinkish dashes (NW Mexico) . *aitkeni* Philip

   Eyes densely short-pilose; abdomen more broadly reddish on sides 9

9. Vertex with large bare black spot surrounding tubercle; mid-frontal callus flanked by dark pollinose crossband; eyes purple with 2 green bands (Chihuahua, ?Durango) ..... *mima* Philip

   Bare area at vertex reduced or wanting; no pronounced dark mid-frontal pollinosity beside ovoid mid-callus; eye pattern unknown ("Mexico") ..... *craverii* (Bellardi)

Hybomitra aitkeni Philip

Since description originally from Mexico, D.F. and Durango, much additional material reveals this to be chiefly a montane species, and shows some melanistic variation. Only one record is from Baja California: a female taken by Paul H. Arnaud, Jr. (CAS), "Sierra San Pedro Martir, on trail Socorro to La Joya, 9.VI.59," about 1200 m alt. J.F. McAlpine and colleagues of the Canadian Mexican Expedition took over a hundred specimens from Durango and 1 from Chihuahua, of which 3 males and 46 females were studied, dated 1 June to 27 July, about 2,250-2600 m alt. Except for the usual sex differences and reddish sublateral spots being a little more extensive, males resemble females. While typically, the subcalli in females are pollinose, and femora and sides of basal abdominal segments reddish, in some there may be bare subcallar areas, or the femora are darkened basally and ground color of sublateral spots is buff to steel-

gray, approaching *H. zancla* Philip. The latter, however, has narrower fronts and antennal plates, and eyes are purple with 2 green bands. In the most melanistic *aitkeni* female from Durango in August, the femora are entirely dark, sublateral spots are reduced gray, and mid-longitudinal black band occupies middle third of venter.

Hybomitra burgeri, new species
Figure 6

Diagnosis: A medium-sized, dark grayish species with blackish, middorsal, abdominal stripe serrated along the margins by reddish-yellow, diagonal dashes, over broad red sides, frontal callosity brownish black, the upper corners rounded, narrowly separated from eyes, and a short, linear extension above; 3 vestigial ocelli on a low tubercle with bare spots at vertex, and 2 hind pairs of legs reddish.

Holotype female, length 15 mm. Eyes ostensibly bare under low magnification, no bands revived on brief relaxing. Frons gray pollinose, some sparse black hairs above, sides sub-parallel, index 1/3.0; an irregular, bare brownish inverted U-shaped spot at vertex with a vestigial ocellus in each arm, and surrounding a small raised tubercle with a suggested, median ocellus. Subcallus, face and cheeks pale gray pollinose, the beard white. Antenna rather short and compact, reddish basally, brown to black beyond dorso-basal angle of plate, which is a little longer than tall and than style, scape not noticeably swollen. Apical palpal segment pale reddish, swollen basally and attenuated apically, mostly pale-haired.

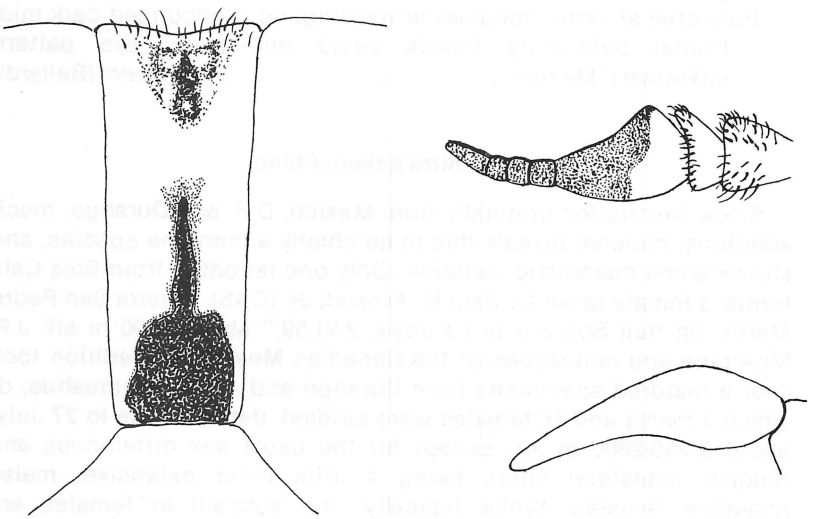

Figure 6. *Hybomitra burgeri* new species, female. Outlines of frons, antenna and palpus.

Scutum and scutellum blackish (worn) without distinct lines; prealar tubercles reddish. Pleura and coxae pinkish gray, mostly white-haired. Legs predominantly reddish with mostly pale hairs including hind tibial fringes; fore femur, fore tibia apically and fore tarsi brown to black. Wing hyaline, costal cell lightly tinted, venation normal without spur vein. Halter with brown stem, pale yellow knob.

Abdomen with broadly reddish sides plus accentuated, yellow-haired, sublateral diagonal paler spots, and red, entirely pale-haired venter. The middorsal black stripe on tergites 2 to 5, narrower than scutellum, median pale triangles only faintly evident (perhaps also reduced by wear).

Type locality: Mexico: Chihuahua, Sierra Madre Mts., 38 km N Creel, 4VII.72. D. Giuliani, at U.V. light. In CAS, Ent. Type No. 11987.

Paratype female, Durango, 10.4 km E El Salto, 21.VI.64. J.F. McAlpine. In CNC. Eyes also without evident hairs, but possibly with 2 faint green stripes on purple ground (briefly relaxed). Callosity more brown, and only the anterior ocellus suggested on small tubercle at vertex.

H. aitkeni Philip also occurs in both states, and specimens were taken in the same vicinity in Durango by the same collector at about the same time as the paratype of *burgeri*. The former differs in expanded, not linear, midfrontal callus, is darker with more isolated sublateral dashes, and the median eye stripe is more distinct. In *H. howdeni* new species, also from Durango, the differences in taller, shorter plate and more convergent frons filled below by the callosity, are quickly apparent by comparison with Figure 7; median pale triangles are plainer in the middorsal black stripe. Ovoid mid-frontal calli differentiate some other related species such as *H. craverii* (Bellardi).

Hybomitra howdeni, new species
Figure 7

Diagnosis: A robust, brownish-red species with 3 rows of abdominal maculae, brownish-red legs, hyaline wing, and antenna with peculiarly wide, short, bicolored plate.

Holotype female, length 16 mm. Eyes with almost imperceptible, short sparse hairs, an indistinct median purple band revived on each (relaxed). Frons pinkish-gray pollinose (apparently somewhat discolored), gently convergent below, index 1/3.2; a small but distinct tubercle without ocelli beneath black hairs at vertex; callosity red, filling lower frons and abruptly tapered above into a narrow, median red ridge half way to vertex, and flanked by median dark pollinosity reaching nearly to tubercle. Subcallus pinkish pollinose without lateral hairs. Face and cheeks whitish pollinose and pilose with some black hairs on upper parafacials beside the antennal bases. Antenna reddish to black distally, black-haired basally, scape swollen, plate as tall as scape, subrectangulate and gently excavated dorsally, distinctively shorter than tall, red basally, sharply black on apical half and on the longer, rather slender style. Palpus II pinkish with mostly pale, and a few black, hairs, swollen basally and tapered to slender points.

Scutal and scutellar integument dark, overlain by obscure gray pollinose lines anteriorly, and pinkish ones laterally across pre-alar tubercles, covered with pale hairs with sparse black and appressed scattered coppery ones intermixed. Pleura and coxae pinkish with long white pile. Remainder of legs reddish, darkened distally on fore tibiae and tarsi, with mostly white hairs, some black ones dorsally on other tibiae including hind-tibial fringes. Wing venation normal, no spur veins, costal cell faintly yellow. Halter brown, knob mostly pale yellow.

Abdomen rounded behind, not unusually tapered, a middorsal band of black-haired geminate spots enclosing tall, though not quite joined, pale-haired triangles which expand behind but do not join lateral pale-haired, narrow incisural fringes on which are based sublateral, diagonal pinkish spots somewhat as in *H. aitkeni* Philip, margined outwardly by reddish-brown, black-haired areas. Venter reddish, entirely pale-haired except for median discontinuous patches of black hairs.

Type locality: Mexico: Durango, 105 km W El Salto, 2700 m alt., 5.V.61. Howden and Martin. In CNC No. 12927. Named for one of the Canadian Mexican Expedition collectors.

Specimens of *H. aitkeni* Philip, taken about the same time within 3.5 km of the type locality of *howdeni* are distinguished by narrower fronts with black callosities, more slender black plates, and more evident eye hairs.

Although 169 *H. aitkeni* Philip (type locality also El Salto), taken by the Expeditions in later years in various Durango localities, were also studied, none other carried the exact data of the above. Variations in

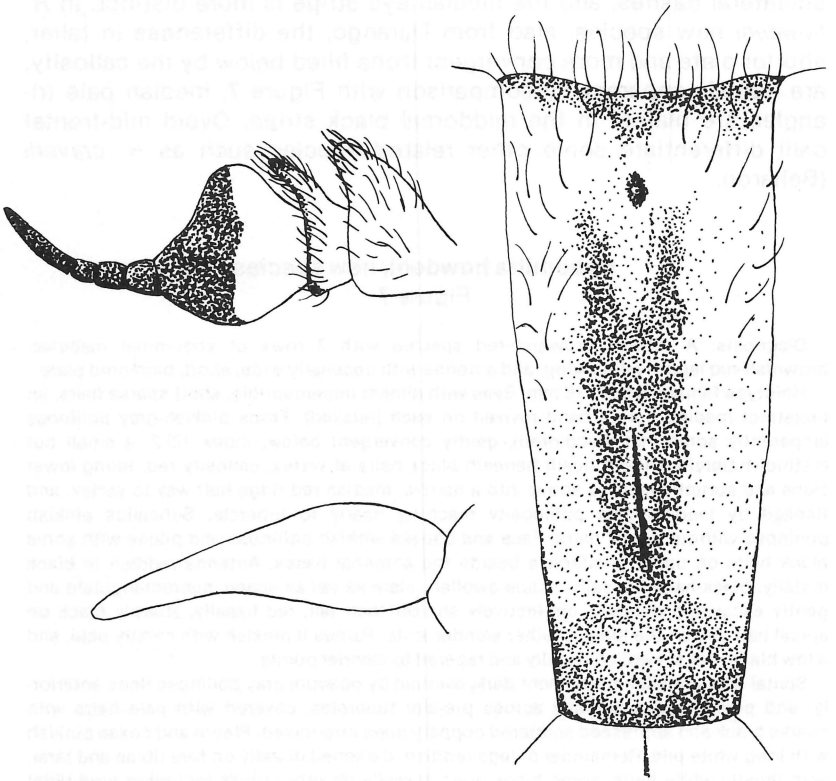

Figure 7. *Hybomitra howdeni* new species, female. Outlines of frons, antenna and palpus.

H. aitkeni were discussed previously. Occasional females have brownish callosities, but these are more rounded and narrowly separated from eye margins in slightly narrower, more parallel fronts, antennae more slender, styles not longer than plates, and scutums more plainly lined. In *H. laticornis* (Hine) with similar though more reddish-patterned abdomens, the fronts are narrower, callosities darker, smaller, and the plates usually entirely red. *H. mima* Philip from Chihuahua, also has some similarities, but the double green-banded eyes were more densely hirsute, the ocelligerous tubercle enclosed by a larger bare brown area at vertex, and the large ovoid blackish median callus, flanked by a transverse black pollinose, mid-frontal spot, is not an extension of the basal callosity. *H. craverii* (Bellardi) from unknown Mexican locality, with an equally wide frons and red callosity, differs in disconnected median ovoid callus, and plate more slender and longer than style.

Some Mangrove-Associated Tabanids, Particularly in Mexico

A collection by Dr. John T. Doyen of University of California, Berkeley, in an unbaited canopy trap set in the middle of a mangrove thicket, Isla San Jose, Gulf of Lower California, 10-11 April, 1974, included 4 females of *Tabanus guatemalanus* Hine and 1 of *T. oldroydi* Philip. This reinforces the postulated idea of breeding in such brackish water ecosystems (Philip, 1976) of certain tabanid species, which includes the above 2 from the eastern and/or northwestern coasts of Mexico, and of *T. vittiger* Thomson in the Galapagos Archipelago.

On recent specimens from Baja California of *T. oldroydi* are labels of collectors or campers from near or behind mangrove. Of course, host-seeking females undoubtedly fly considerable distances from probable mangrove breeding environs, but this hardly explains the record of *T. oldroydi* from near Yuma, Arizona (Philip, 1971), which may indicate the species is also breeding along the lower Colorado River. Most are early spring records in April, but 2 are for as late as 17 June and 27 July.

The coastal records for *T. guatemalanus* are from around the Caribbean and Mexican Gulf Coast areas and include southern Florida, as well as northwestern Mexico from Sonora and Baja California to Nayarit, 10 April to 16 August. I have also seen specimens from Yucatan, Campeche and Quintana Roo on the eastern coast, 20 March to 15 October. These considerations seem to support specific separation from more inland *T. subsimilis* Bellardi to which it has been related by me and others in the recent past.

In the American Museum of Natural History is a female of *Stenotabanus (Aegialomyia) littoreus* (Hine) taken at the port of Progreso, Yucatan, 21 August 1964, a species of which Hine (1907) reports the

type series of both sexes as collected at Puerto Barrios, Guatemala, "from twigs and branches of mangrove growing just at the edge of the water." This is probably another species adapted to breeding in such brackish environs. Six more of this species, dated 3, 12.VIII.74, and 4.VIII.75, were taken in a New Jersey Light Trap in or near mangrove at coastal Cancun, Quintana Roo, by Dr. Donald J. Pletsch of Mexico, D.F., to whom I am also indebted for the following records from the same environs, all females, in both years: *T. guatemalanus,* 8, 23-27.III; 3, 21-24.IV; 2, 4-20.V; 3, 2-21.VI; 5, 1-25.VII: 4, 13-15.VIII; and 1, 15.X. *T. campechianus* Townsend, 3, 24-27.III; 2, 21-27.IV; 3, 5.V; 8, 2.VI; 8, 3-5VII; 13, VIII; and 2, 5-6.XII. These were intermittent collections, so only reflect availability of the flies on the dates of collection in mangrove environs.

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Review of the genus *Essostrutha* Thomson

(Coleoptera: Cerambycidae)

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The hemilophine genus *Essostrutha* was proposed by Thomson (1868) to accommodate *Saperda laeta* Newman from Mexico. Lacordaire (1872) added the variety *miniata* and Bates (1881) described three new species of *Essostrutha.* There appeared to be some uncertainty as to the identities of some of the described forms with Bates proposing the name *fimbriolata* for *Amphionycha albina* Pascoe and also elevating *miniata* to a species level.

As presently defined, this genus occurs only in Mexico and Guatemala. The five species, *ramsdeni* Fisher (1926), *roberto* Fisher (1935), *scaramuzzai* Fisher (1936), *montivagans* Fisher (1942), and *alayoi* Zayas (1956) described as *Essostrutha* from Cuba are tentatively assigned to the genus *Adesmus* Latreille based upon the flattened front of the head, prominent humeri and emarginate apices of the elytra.

Essostrutha Thomson

Essostrutha Thomson, 1868, Physis, 2: 198; Lacordaire, 1872, Genera des coleopteres, 9: 895; Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5: 210.

Form small to moderate-sized, subparallel. Head with front transverse, convex, median line extending onto neck; mandibles stout, curved at apex; palpi unequal, slender; eyes finely faceted, deeply emarginate, upper lobes small, widely separated, lower lobes as long as genae; antennae slender, a little longer than body, scape much shorter than third segment, fourth slightly longer than scape, segments ciliate beneath, ciliae becoming less numerous toward apex. Pronotum broader than long, sides sinuate; base impressed laterally and dorsally on each side of middle; prosternum narrow, intercoxal process very slender, expanded at apex, coxal cavities closed behind; mesosternum with intercoxal process arcuate, lying below tops of coxae. Elytra about twice as long as broad, disk plane; apices rounded. Legs short, femora rather slender; middle tibiae sulcate externally, front tibiae internally; claws bifed. Abdomen normally segmented.

Type species: *Saperda laeta* Newman (monobasic).

The robust form, convex front of the head, rather short antennal scape and fringed antennae characterize this genus. The closest relative, *Erana* Bates, differs by the smaller size, longer antennal scape and by having the fringe of hairs above as well as below on the antennal segments.

The Pan-Pacific Entomologist 54:125-128. April 1978.

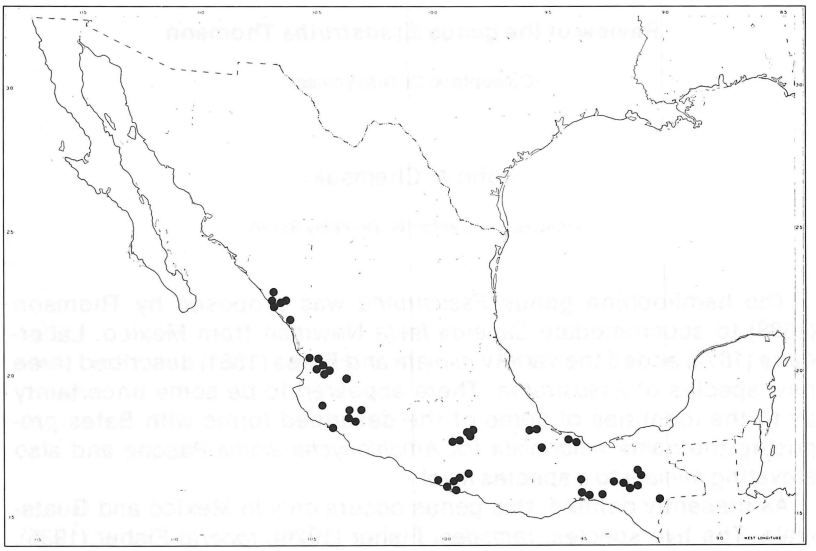

Figure 1. Known distribution of *Essostrutha laeta* (Newman) in Mexico.

Elytra partially or predominantly reddish to yellow, pale pubescence obscuring surface, if all black, suture not narrowly yellowish pubescent; pronotum very often with four black spots. Larger species, 8-16 mm. Sinaloa, Mexico to Guatemala ..... *laeta*

Elytra black, pale pubescence not obscuring surface, suture narrowly, densely yellow pubescent; pronotum with two basal black spots only. Smaller species, 7-11 mm. Sonora to Puebla ..... *binotata*

Essostrutha laeta (Newman)

Saperda laeta Newman, 1840, Entomol., 1:13.

Essostrutha laeta, Thomson, 1868, Physis, 2:199; Lacordaire, 1872, Genera des coleopteres, 9:895; Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5:210.

Amphionycha albina Pascoe, 1858, Trans. Entomol. Soc. London (2)4: 256. **New synonymy.**

Essostrutha albina, Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5:211.

Essostrutha laeta var. *miniata* Lacordaire, 1872, Genera des coleopteres, 9:895. **New synonymy.**

Essostrutha miniata, Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5:211.

Essostrutha fimbriolata Bates, 1881, Biologia Centrali-Americana, Co-

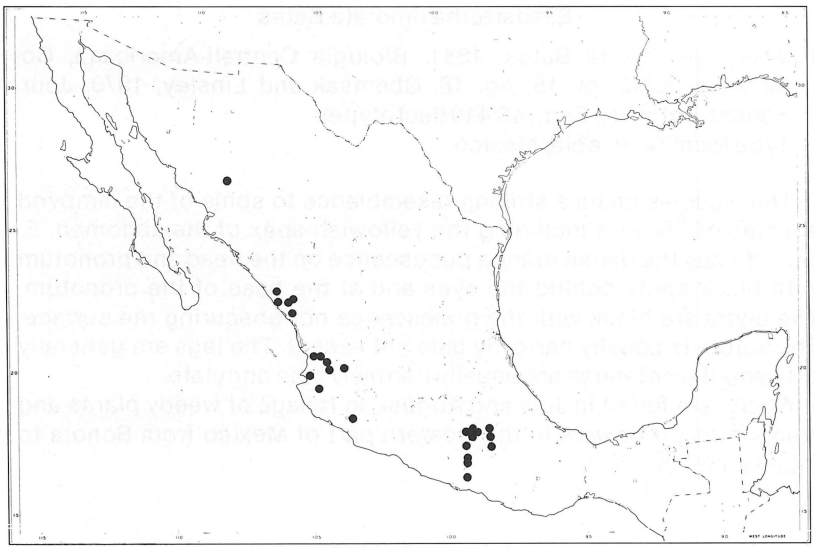

Figure 2. Known distribution of *E. binotata* Bates.

leoptera, 5:210; Casey, 1913, Memoirs on the Coleoptera, 4:364. Chemsak and Linsley, 1970, Jour. Kansas Entomol. Soc. 43:410 (lectotype). **New synonymy.**

Essostrutha cinnabarina Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5:211; *ibid.*, 1885: 428; Chemsak and Linsley, 1970, Journ. Kansas Entomol. Soc. 43:410 (lectotype). **New synonymy.**

Type locality: of *laeta*, Mexico; *albina*, Guatemala; *miniata*, Mexico; *fimbriolata*, Playa Vicente, Mexico; *cinnabarina*, Zapote, Guatemala.

This common species may be easily recognized by the dense, short, appressed reddish to yellowish or grayish pubescence. Males are generally unicolorous with only the black pronotal spots present but occasionally also have the apices of the elytra narrowly black. Females usually have the elytra broadly black at the apices and at least a narrow black basal band. Occasionally only the humeri are black. Individuals of both sexes with all black elytra do occur, particularly in Vera Cruz and neighboring Oaxaca. These occur with normally colored individuals.

The most striking variation is expressed by the color of the pale pubescence of the body. This ranges from bright red to yellow to almost gray. The pronotal spots are sometimes reduced to only the basal pair.

This species ranges from the state of Sinaloa to Veracruz to Guatemala (Fig. 1). Adults are commonly encountered on grasses and foliage in June through August.

Essostrutha binotata Bates

Essostrutha binotata Bates, 1881, Biologia Centrali-Americana, Coleoptera, 5:212, pl. 15, fig. 18; Chemsak and Linsley, 1970, Jour. Kansas Entomol. Soc., 43:410 (lectotype).
Type locality: Puebla, Mexico.

This species bears a striking resemblance to some of the lampyrid species of *Photinus* including the yellowish apex of the abdomen. *E. binotata* has the dense orange pubescence on the head and pronotum with black spots behind the eyes and at the base of the pronotum. The elytra are black with the pubescence not obscuring the surface. The suture is usually narrowly pale pubescent. The legs are generally pale and the antennae are usually narrowly pale annulate.

Adults are found in July and August on foliage of weedy plants and sometimes on flowers in the western part of Mexico from Sonora to Puebla (Fig. 2).

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RECENT LITERATURE

Kaston, B.J. 1978. How to Know the Spiders. 3rd edition, Wm. C. Brown Co. 272 pp, 700 figs. $5.95 soft cover.

This new edition of Kaston's well known work in the Jaques Picture Key Nature Series includes 13 genera and 121 species not included in the other editions, bringing the total to nearly twice that covered in the first edition. An excellent introductory section, a combined illustrated glossary and index, as well as superb illustrations serve to make this book indespensible to the spider enthusiast — ARH.

New Host Records and Notes on the Dipterous Family Aulacigastridae[1]

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The family Aulacigastridae (Diptera) is represented in North America by one described species, *Aulacigaster leucopeza* (Meigen). Larvae of this fly live in the sap exuded from tree wounds (Malloch and McAtee 1924). Robinson (1953) described the immature stages of *A. leucopeza* and presented biological notes on its life history. She found adults and larvae occurring on elm and chestnut in Sheffield, England.

In the Nearctic region few host records exist for this unusual fly. Christianson and Ryckman (1955) reared adults from larvae they collected on a cottonwood slime flux in California. They also reported U.S. National Museum records of adults on ponderosa pine in New Mexico, elm in Idaho, and oak in California. Teskey (1976) reported Canadian National Collection records of larvae from mulberry, and adults on elm, poplar, and Manitoba maple. Cole (1969) recorded larvae and adults from California but made no mention of the host trees.

During the spring and summer of 1977 we took numerous larvae and adults throughout northeastern Oregon. Adults were collected, and larvae reared, from seeps on wounded Douglas fir [*Pseudotsuga menziesii* (Mirbel) Franco] trees. Adults were also taken at wounds on ponderosa pine (*Pinus ponderosa* Douglas), mountain alder [*Alnus incana* (L.) Moench] and a species of maple (*Acer* sp.).

Adults were most often encountered in early June on or near the sap flows of wounded trees. They were easily disturbed and usually flew away when we approached the infected trees. The best way to collect them was to wait at the tree for their return, and then slowly aspirate them from the seep area. As the season continued fewer and fewer adults were taken at the seeps. The fact that adults were most prevalent in early June correlates well with Robinson's hypothesis (1953) that adults meet early in the season to mate and lay eggs at the seep. We also found a number of mating pairs at this time.

Larvae were taken throughout the season (June to September) at numerous Douglas fir seeps. Those larvae brought into the laboratory to rear eventually eclosed by the end of August or early September. Thus it is probable that eggs are laid in early June, the larvae remain in the seeps throughout the summer, and pupation occurs in late

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August or early September. The seeps tend to dry-up as the season comes to an end, and we feel it is probably this change in the larval habitat which is a factor in initiating pupation.

It is not known how the fly overwinters. The data seem to indicate that they pass winter as pupae or pharate adults still in the pupal case. We collected no adults at the end of the season, thus we feel it is doubtful that they pass winter in this stage. However, they do occur early the following spring and this supports the contention that they pass the winter as pupae or pharate adults. In addition, upon examination of a seep in mid-September we found a fully formed adult still in the pupal case. It was impossible to tell if it was going to pass the winter as a pharate adult or if it was going to emerge before the end of the season. As the season was drawing to an end, and nights were growing exceedingly cold, it is doubtful that this adult was going to emerge that season. The larvae that we reared to the adult stage in the laboratory were probably affected by removing them from the drying seep and placing them in more favorable conditions, and thereby causing an early eclosion.

Acknowledgments

We gratefully acknowledge the assistance of W. J. Turner and R. D. Akre in the preparation of this manuscript. The determination of *A. leucopeza* was verified by C. W. Sabrosky of the U.S. National Museum.

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The Genus *Dolichovespula* and an Addition to Its Known Species of North America

(Hymenoptera:Vespidae)

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The generic and subgeneric divisions of the subfamily Vespinae were described by Bequaert (1930, 1931). He concluded that the subfamily included three genera; *Provespa* Ashmead for the Oriental nocturnal hornets, *Vespa* Linnaeus for the true hornets, and *Vespula* Thompson for the yellowjackets. He recognized two subgenera of *Vespula; Vespula* for species with short oculo-malar spaces, and *Dolichovespula* Rohwer for species with long oculo-malar spaces.

The most recent major work on the taxonomy and distribution of the Nearctic Vespini was that of Miller (1961) who accepted the generic concepts of Bequaert. By means of distributional data and by accepting "stable color patterns as supplementary evidence to define species" he was very successful in clarifying the status of most North American species. He was also correct when he stated that further elucidation of the taxonomy of the yellowjackets would have to come from field studies (Miller 1958).

In recent years many workers have published biological and behavioral studies of these wasps and most of Miller's taxonomic conclusions have been substantiated. These studies have also provided increasing evidence to support the validity of generic status for *Dolichovespula* as suggested by Guiglia (1948) and subsequently accepted by Bluthgen (1961), Yamane (1975), and Greene et al. (1976). Of the numerous classifications of Vespinae proposed during the past 50 years, that of Guiglia is the most natural in the opinion of the author and it is followed in this paper.

Generic characters.

A comparison of the following characters serves to define the genera *Vespula* and *Dolichovespula* as natural taxonomic groups at least as distinct from one another as from the closest relative, *Vespa*.

Vespula Thomson, 1869. Opusc. Ent. v. 1 p. 79.

Type: *Vespa austriaca* Panzer. Designated by Ashmead, 1902.

(a) oculo-malar space at most half the length of the penultimate antennal segment
(b) lateral, vertical carina on pronotum obsolete or faintly marked in only the lower portion
(c) branches of the penis completely fused resulting in a disc-like or saddle-shaped apical lobe
(d) tyloides (welts) not present on apical flagellar segments of the male antennae
(e) mandible of last-instar larva always tridentate
(f) spiracular atria of last-instar larva armed with simple, mostly unbranched spines.

The Pan-Pacific Entomologist 54:131-142. April 1978.

Dolichovespula Rohwer, 1916. Conn. State Geol. and Nat. Hist. Survey Bull. 22:642.

Type: *Vespa maculata* Linnaeus

(a) oculo-malar space nearly as long or longer than the penultimate antennal segment
(b) lateral, vertical carina on pronotum well developed in the upper portion
(c) branches of the penis incompletely fused resulting in a pair of pointed apical lobes
(d) tyloides (welts) usually present on the apical flagellar segments of the male antennae
(e) mandible of last-instar larva always terminating in a single ventral apical tooth[1]
(f) spiracular atria of last-instar larva armed with many multibranched spines

The author has collected and examined adults of all known North American species of both genera and found the first three characters to be consistent. The only exception to the fourth, the presence of tyloides on the male antennal segments, in North American *Dolichovespula* species is the social parasite, *Dolichovespula artica* Rohwer. The larval characters are consistent in all North American species collected. Only the larvae of *Vespula intermedia* (Buysson) and *V. austriaca,* the nests of which have not yet been discovered in North America, have not been examined.[2]

In the course of field investigations of the North American yellowjackets, the author has discovered that *Dolichovespula saxonica* (Fabricius) which has been considered to be Palearctic is also widely distributed in the Nearctic fauna (Fig. 2). A definitive character for discrimination of this species from related Nearctic species is established and included in the key to species at the end of this paper.

Although it was possible to define the distribution of *D. saxonica* in North America reasonably well, available knowledge on the distribution of this and other *Dolichovespula* species in the Palearctic and Oriental regions was found to be incomplete. Any continuity between the Nearctic and Palearctic populations must, therefore, remain hypothetical.

The Subgenera of Dolichovespula

Within North America, only two subgenera of *Dolichovespula* as defined by Bluthgen (1943) are present. The subgenus *Dolichovespula* (S. Str.) is represented by the baldfaced "hornet", *D. maculata*, which is a particularly distinct, widespread species. It is mentioned here only to provide additional distributional information. Miller (1961) pre-

[1]The reported exception to this larval mandible configuration was that of *Dolichovespula silvestris* Scopoli which according to Short (1952) had a tridentate mandible. I have examined larvae of *D. silvestris* collected by M.E. Archer and provided to me by O.W. Richards of the British Museum. The larval mandible is not tridentate but is typical of the genus terminating in a single emarginate ventral apical tooth. As Prof. Richards states "the mandibles of the larvae of *Dolichovespula* are all very much alike" (pers. com.).

[2]Report of the parasitic association of *V. austriaca* and *Vespula maculifrons* (Buysson) by Evans (1975) was erroneous (pers. com.). The host relationship for *V. austriaca* in North America has yet to be established. Field observations and collection data indicate that *Vespula acadica* (Sladen) has the greatest distributional correlation with *V. austriaca* and may well be the usual host of this parasitic species. It is probable that *V. austriaca* may parasitize other Nearctic species of the subgenus *Allovespula* as well.

sented distributional data which was quite complete, but he did not report the occurrence of this species in Alaska. The author collected several workers of *D. maculata* between Fairbanks and Harding Lake, about 48 km to the southeast, in early August of 1973 and 1976. It was not encountered at other collecting sites in Alaska during these years.

The remaining North American *Dolichovespula* are found in the subgenus *Boreovespula.* This taxon is particularly homogeneous and has historically presented taxonomic difficulties at the species level. Birula (1930) recognized only one Palearctic species, *Dolichovespula norwegica* (Fabricius) and he considered *D. saxonica* to be a subspecies even though he recognized structural differences in the shape of the ocellar triangle, the pattern in punctation, and the male genitalia. These differences were subsequently used to separate the two species by European taxonomists (e.g. Bluthgen 1961, Guiglia 1948).

It was only where series of specimens were strikingly different in appearance that Birula saw fit to distinguish them by a subspecific name. Such a case was that of *Dolichovespula pacifica* (Birula) which he considered to be another subspecies of *D. norwegica.* In his revision of the Oriental *Boreovespula,* Yamane (1975) found that there were actually at least two species which had been included in collections under the name of *D. pacifica*. Ratios between the measurements of head-width versus oculo-malar length of field-collected specimens yielded two distinct groups. When worker specimens collected from nests were measured, he found that their mean ratios agreed with one of the mean ratios previously established. Using these data and other characters (ocellar placement and clypeal markings), he was able to separate the specimens into *D. pacifica* and *Dolichovespula saxonica nipponica* Yamane. Judging from Birula's description of some males of *D. pacifica* which had no antennal tyloides, he may also have been examining male specimens of a parasitic species. Both *D. pacifica* and *D. s. nipponica* possess tyloides on their antennal flagella and I have been provided male specimens under the name *Dolichovespula adulterina* (Buysson) by Mr. Yamane which are colored much like *D. pacifica* but lack tyloides.

Birula also commented at length with regard to the apparent transition in coloration of the markings on *D. norwegica* from yellow to ivory-white as he followed the distribution of this species from Europe towards East Siberia. He considered the whitish marked forms to be transitional to *D. pacifica* even though typically yellow marked *D. norwegica* were often recorded from the same localities. I have only seen two queen specimens of this white marked form, both from the island of Sakhalin. These specimens kindly loaned to me by Mr. Yamane and identified as *D. norwegica* subsp., are very similar to the Nearctic species *Dolichovespula albida* (Sladen) (= *Vespa marginata*

Kirby preocc) but without examing workers and males, their relationship is unsure. It would certainly not be inconceivable that the distribution of *D. albida* could, in fact, be Holarctic and that within East Siberia it could be sympatric with typical *D. norwegica* thus explaining Birula's observations of the presence of both color forms.

While studying *Dolichovespula* in Alaska during the summer of 1973, the author found what first appeared to be atypical colonies of *Dolichovespula norvegicoides* (Sladen). Typical nests of that species which I have collected, were invariably built in cavities in stream banks or within root tangles of uprooted trees adjacent to streams. They were nearly spherical and about 6 cm in diameter with the outer envelopes of grey fibrous paper, entire from the nest pole to its ventral entry. This description also fits nests of *D. norvegicoides* reported by previous investigators. One atypical nest was located inside a wall void of a wood-siding covered building at King's Mountain Wayside, Alaska, about 160 km southeast of Anchorage. The nest was not visible through the 2 cm gap in the siding which was being used by the workers as an entrance. Worker activity was at a rate of about ten per minute. They were net collected until activity had nearly ceased. The siding was then removed, exposing a nest of about 13 cm diameter with a thickness of 4.1 cm due to the constraints of the void (Fig. 1). The colony contained the queen mother and 55 workers, including those which had been netted. It also contained a queen of the social parasite *D. arctica.* Emergence of male specimens of *D. arctica* from nest combs within the next few days indicated that a *D. arctica* queen had been present in the nest for at least three weeks before the nest was collected. The nest envelope differed from *D. norvegicoides* nests in that it was composed of nine concentric sheets of grey paper only the middle three of which reached the nest entrance. The outer three sheets each terminated closer to the nest attachment than the one immediately inside it giving the nest a tiered appearance similar to the nests of Palearctic *D. saxonica.*

A second nest of this species was found in a supraterrestrial nest site at Eagle River, Alaska. The nest, which was 10.7 cm in diameter and had one worker and one queen comb, had been constructed on the surface of the ground in a shallow cavity hollowed out of leaf litter among shrubs about 15 meters from the edge of the river. As the term "supraterrestrial" is also meant to indicate, the wasps did not appear to have excavated soil for the nest site. The collected nest compliment included 41 workers, no identifiable queen mother, 11 new queens and 26 males. The combs were held for further emergence and subsequently produced 51 more queens and four males. The nest envelope was of grey fibrous paper and incorporated leaf fragments. Individual sheets were interconnected at many points, resulting in a spongy fibrous mass rather than the discrete sheets of an aerial or cavity nest.

Figure 1. A nest of *Dolichovespula saxonica* (F.) in situ in a building wall void at King's Mountain, Alaska. Siding had been removed to expose the nest.

Methods and Materials

Since the oculo-malar space is a useful character separating *Vespula* and *Dolichovespula,* and is shown to be applicable at the specific level (Yamane 1975), the constancy of this character was investigated in North American *Boreovespula*. The most widespread and easily recognizable species in the Nearctic region is *Dolichovespula arenaria* (Fabricius). This species is very common and specimens were available from many localities throughout its distributional range. A series of worker specimens was examined from each of 17 widely separated localities. The width of the head at its widest point and the length of the oculo-malar space were measured for each specimen. The ratio between these measurements for each specimen and the mean ratio for each series were calculated.

Six series of worker specimens of *D. norvegicoides* from various localities as well as samples from the two previously described Alaskan nests, a sample netted at Eagle River, Alaska and a sample from Banff, Alberta, Canada, were measured and ratios calculated. The combined data from the 27 groups which had been measured were subjected to analysis of variance and Duncan's Multiple Range Test. In order to show possible clinality of the oculo-malar/head width

ratios as correlated to latitude, longitude and elevation of the sites of collection, a stepwise regression analysis was performed on each of the three sample groups defined by the previous tests.

Results

In summary of the analytical results presented in Table 1, the head width/oculo-malar ratios of all 17 *D. arenaria* samples were significantly different from those of the six samples of *D. norvegicoides*. The remaining four samples of wasps were also significantly different from *D. norvegicoides* which they closely resembled, but were not different from *D. arenaria* in head width/oculo-malar ratios. Results of the stepwise regression analysis of the 17 *D. arenaria* samples

Species	n	$\bar{x}$ HW (mm)	$\bar{x}$ OM (mm)	HW/OM $\bar{x}$ (SD)[a]	Specimen origin Latitude	Longitude	Elevation (M)
D. arenaria	5	3.30	0.45	7.258 (0.315)a	34°10'	117°05'	1830
	10	3.26	0.45	7.222 (0.360)a-b	35°30'	83°00'	915
	10	3.46	0.48	7.172 (0.230)a-c	37°55'	122°40'	300
	10	3.38	0.47	7.154 (0.255)a-c	37°45'	119°30'	3200
	8	3.36	0.47	7.141 (0.375)a-c	48°30'	96°40'	300
	7	3.52	0.49	7.116 (0.111)a-d	37°45'	122°26'	150
	5	3.45	0.49	7.052 (0.382)a-e	37°20'	122°25'	230
	10	3.29	0.47	7.030 (0.216)a-f	48°07'	123°30'	150
	7	3.55	0.51	7.027 (0.395)a-f	36°30'	118°40'	1830
	10	3.30	0.48	6.878 (0.357)c-g	64°25'	146°50'	275
	10	3.32	0.49	6.872 (0.304)c-g	64°25'	146°52'	230
	10	3.45	0.51	6.764 (0.160)e-h	42°20'	85°15'	230
	8	3.41	0.51	6.740 (0.283)f-h	55°00'	119°00'	610
	10	3.32	0.49	6.737 (0.264)f-h	40°48'	72°42'	75
	10	3.47	0.52	6.709 (0.187)g-h	53°28'	114°10'	640
	6	3.50	0.53	6.653 (0.184)g-h	58°40'	136°40'	30
	10	3.53	0.54	6.572 (0.283)h	61°20'	149°30'	120
D. norvegicoides	10	3.14	0.54	5.877 (0.242)i	64°25'	146°25'	230
	10	3.20	0.55	5.862 (0.287)i	49°47'	94°29'	305
	10	3.38	0.58	5.845 (0.192)i	53°28'	114°00'	640
	8	3.21	0.56	5.730 (0.343)i	45°34'	69°35'	460
	10	3.08	0.54	5.730 (0.317)i	44°23'	64°15'	75
	10	3.04	0.54	5.609 (0.198)i	64°25'	146°55'	230
D. saxonica	10	3.13	0.44	7.068 (0.386)a-e	51°30'	116°00'	2440
	10	3.23	0.47	6.961 (0.266)b-g	61°46'	148°30'	245
	10	3.27	0.48	6.815 (0.295)d-h	61°20'	149°30'	120
	10	3.25	0.48	6.815 (0.289)d-h	61°20'	149°30'	120

[a]Mean ratios not followed by the same letter are significantly different ($P = < .05$) according to Duncan's Multiple Range Test.

Table 1. Head width/Oculo-malar (HW/OM) length ratios of some Nearctic *Dolichovespula* species and correlation to the locations of the sites of specimen collections.

indicate that latitude is the factor most strongly correlated with head width/oculo-malar ratio, followed by longitude and elevation. The formula generated by the analysis was, ratio = 7.3818 - 0.01728 (degrees latitude) + 0.003 (degrees longitude) + 0.00003 (meters elevation). r = 0.4656 n = 146.

With *D. norvegicoides* no significant correlation could be shown among the factors analyzed but this may be due to smaller sample size. Analysis of the four samples of the remaining *Dolichovespula* species again showed a stronger correlation of the ratio with latitude than with longitude or elevation. The formula generated for this species was, ratio =−1.77769 + 0.13872 (degrees latitude) + 0.99968 (meters elevation). r = 0.3390 n = 40. Due to the narrow range of longitudes represented in the samples, no longitude correlation was calculable.

The data presented in Table 1 show that there is a clinality with regard to the head width/oculo-malar length ratio. This ratio becomes smaller with increasing latitude and elevation. The influence of elevation would appear to be very slight from the formulae generated by stepwise regression analysis.

Discussion

The analytical tests performed on data from worker specimens proved the reliability of head measurements for the separation of two very similar appearing species. Examination of queens and males was made to assure that they could also be properly determined. Sixty-one queen specimens which had been previously assigned to *D. norvegicoides* were measured and their oculo-malar/head width ratios calculated. As had been found with the worker specimens, the queens also exhibited two modes with regard to this ratio. The geographic distribution of queens and workers with each type of oculo-malar space coincided.

In order to assure the assignment of each of the species to the proper taxon, the type specimen of *D. norvegicoides* was obtained from the Canadian National Museum. The lectotype queen (No. 6823, Amherst, Nova Scotia, VII-2-15) was found to possess the longer oculo-malar space of 0.77 mm and a head width of 3.80 mm for a ratio of 5.28. Examination of the allotype male (Sladen's No. 2186, Inverness, B.C., July 1910, J.H. Keen collector) was also made. This locality is just to the SSE of Prince Rupert, B.C., and is within the geographic distribution of *D. norvegicoides* as delimited by the queens and workers.

Although the digitus of the male genitalia provides an excellent means of separating some vespine species within the *Boreovespula*, the male genitalia of other species are almost identical and other characters must be used to separate these species. Within the subgenus *Boreovespula* it has been recognized that the presence or

absence of tyloides or welts on the apical flagellar segments of the male antennae is characteristic of species. For example, Bequaert (1931) was able to structurally separate males of *D. albida* which possess one basal tyloide on each of the last five antennal segments from those of *D. norvegicoides* which possess two tyloides on each of the last six segments. Examination of the allotype male verified this tyloide arrangement as did other males collected within the geographical distribution of *D. norvegicoides* as shown on Figure 2.

Males collected from the mountains of the Continental Divide of North America, where the species with the short oculo-malar space is distributed, possess a tyloide arrangement different from either *D. norvegicoides* or *D. albida*. They possess a single basal tyloid on the apical segment, two tyloides on the next three segments and a single basal tyloide on the fifth and sixth segments. The author has designated this arrangement as a tyloide formula of 1-2-2-2-1-1. This

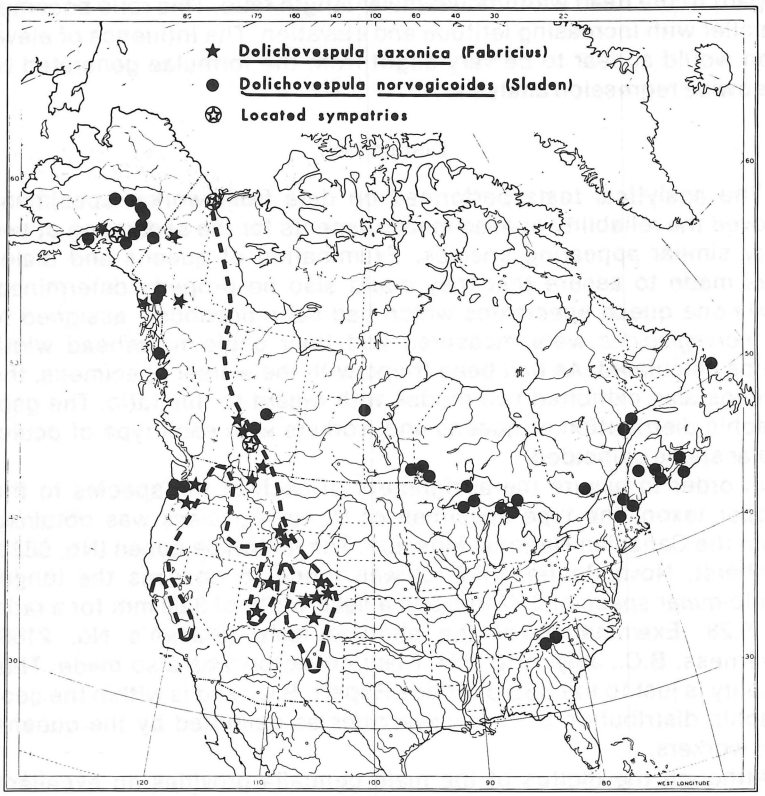

Figure 2. The distribution of *Dolichovespula saxonica* (F.) and *Dolichovespula norvegicoides* (Sladen) in North America. Note the dotted line which roughly outlines the major mountainous areas of the west.

formula exactly duplicates the tyloide arrangement of the Palearctic species *D. saxonica.* Comparisons of specimens of all castes of the short oculo-malar species from North America with Palearctic specimens of *D. saxonica* demonstrate that they should be assigned to this taxon. The color pattern of all North American *D. saxonica* examined (310 specimens, including 82 queens, 30 males and 198 workers) is usually less extensively yellow than that of most European specimens of that species, but is indistinguishable from melanic Palearctic individuals. The diverse nesting habits exhibited by *D. saxonica* in North America closely correspond to those reported by European workers for Palearctic populations of this species.

In Figure 2, the major mountainous areas of Western North America have been roughly outlined. All of the Nearctic specimens of *D. saxonica* which I have seen have been collected within these areas. East of these mountains only *D. norvegicoides* has been found although this species is also found at lower elevations along the Pacific Coast from the Washington-Oregon border northward to Alaska. Within the distribution of *D. saxonica* limited sympatry of the two species has been noted. The indicated sympatry in Southern Alberta, Canada and in South Central Alaska resulted from collections made by the author. The records from the Mackenzie River Delta came from collections made in 1930 and 1931 by Mr. Owen Bryant. Although the specimens were all labeled Aklavik, N.W.T., specimens of other *Vespula* and *Dolichovespula* species which inhabit very diverse habitats were also identically labeled. In 1976, I went to Inuvik which is about 65 km to the east of Aklavik and also on the Mackenzie River Delta and at the same elevation. At Inuvik, *D. albida* was as common as it is in many other taiga habitats but no other species of yellowjackets were collected. Even now, locations with names are widely separated in the Canadian Arctic and I must suspect that some of the Aklavik specimens may have been collected at considerable distances from the named collecting site, possibly into the Richardson Mountains to the West. Although the author collected *D. albida* in sympatry with *D. saxonica* at Eagle River, AK, the terrain in the MacKenzie River Delta is very dissimilar to any sites where I have collected either *D. saxonica* or *D. norvegicoides* and the Aklavic record of sympatry remains questionable.

The distributional patterns of the two species are less clear at the Northwestern portion of their ranges. It appears that considerable sympatry may occur but it was documented on only one occasion. Although *D. saxonica* inhabits the higher mountain localities in the Canadian Rocky mountains and southward, in Alaska I have only encountered it at lower elevations in association with mixed hardwood/conifer forests. In the taiga and coniferous localities of central and Pacific coastal Alaska, *D. norvegicoides* is quite common. Very few yellowjacket specimens have been available from longitude 150° west

to the Bering Sea due to the relative inaccessibility of that area. Thorough collecting within that area will be essential to the definition of the Northwestern distributional limits of North American species of the *Boreovespula*. Clarification of any interrelationships between Nearctic and Asian faunas will also require similar data from specimen material collected in Eastern Siberia, particularly the Chukotskiy Peninsula.

Key to the North American Dolichovespula

1. Lower half of the sides of the pronotum and lower half of propodeum transversely striate. Moderately large wasps with indistinct dimorphism between queen and worker. Male with two prominent tyloides on the flagellar antennal segments particularly the 6th through the 11th. Black marked with ivory white in the one North American species. The baldfaced hornet, *Dolichovespula maculata* (F.) . . . . . Subgenus *Dolichovespula*

   Lower half of the sides of the pronotum and lower half of propodeum punctate. Smaller wasps with distinct dimorphism between queen and worker. Males with or without tyloides on flagellar antennal segments. Subgenus *Boreovespula* 2

2. Workers not present. Anterior margin of the clypeus in the female with prominent tooth-like lateral angles. Flagellar antennal segments of the males almost entirely black without or with only slight traces of tyloides. Usually marked with ivory-white although in some specimens, particularly from the southwestern United States, the markings are sometimes yellowish. Socially parasitic upon other *Boreovespula* species. . . . . *Dolichovespula arctica* (Rohwer)

   Workers present. Anterior margin of the clypeus in the females with broadly rounded lateral angles. Flagellar antennal segments of males with various arrangements of tyloides 3

3. Pale markings white or ivory-white. Rufous lateral markings usually present on second and sometimes also in the first abdominal tergites in the worker and male. Rufous abdominal marking absent in queen. Ocellar triangle broad; the distance between the posterior pair subequal to their distance from the inner margins of the eyes. A single basal tyloide present on each of the last five antennal segments in the male . . . . . *Dolichovespula albida* (Sladen)

   Pale markings yellow or dirty yellow. Rufous abdominal markings rarely present. Ocellar triangle nearly equilateral; the distance between the posterior pair about 3/4 of their distance to the inner margins of the eyes. Tyloide arrangement different 4

4. Yellow bands of first and second abdominal tergites deeply interrupted by a black median point. Yellow hind margin of pronotum usually produced downward along lateral, vertical carina. Yellow markings along posterior margins of eyes uninterrupted from genal to temporal areas of head. Flagellar antennal segments of the male with two tyloides on each of the apical six segments. Oculo-malar length variable, becoming slightly longer with increasing north latitude ..... *Dolichovespula arenaria* (F.)

   Yellow bands of first and second abdominal tergites narrow, continuous, only faintly narrowed medially. Yellow hind margin of pronotum little or not produced downward along the anterior, vertical carina. Yellow markings along posterior margins of eyes usually reduced to spots on the tempora and usually also on the genae 5

5. Oculo-malar length long. Ratio between head width and oculo-malar length less than 6.40 in the worker and 6.20 in the queen. Antennal flagellum of male with two tyloides on each of the apical six segments. Genal markings usually wider than the temporal markings. Yellow bands on abdominal tergites two through five subequal in width..... *Dolichovespula norvegicoides* (Sladen)

   Oculo-malar length short. Ratio between head-width and oculo-malar length greater than 6.40 in the worker and 6.20 in the queen. Antennal flagellum of male with one tyloide on the apical, fifth and sixth segments and two tyloides on the second, third and fourth segments. Genal markings usually narrower than the temporal markings. Yellow bands of increasing width on abdominal tergites two through five, the fifth often bearing a pair of free black spots .... *Dolichovespula saxonica* (Fabricius)

Acknowledgements

The author wishes to thank Mr. D.A. Reierson for assistance in field collection of specimen material and for review of the manuscript. Assistance with statistical analyses was kindly provided by Dr. V. Sevacherian and Dr. M.K. Rust.

Thanks are also given for the loan of museum specimens to Mr. S. Frommer, University of California, Riverside; Mr. J. Chemsak, University of California Berkeley; Mr. R. Schuster, University of California, Davis; Dr. P. Arnaud, California Academy of Sciences, San Francisco; Mr. R. Snelling, Los Angeles County Museum; and Dr. L. Masner, Canadian National Collections.

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RECENT LITERATURE

Z. Kazab, 1977. Die Tenebrioniden des papuanischen Gebietes I. Strongyliini (Coleoptera, Tenebrionidae Pacific Insects Monograph 33:1-219. 79 figs., 16 plates. Dept. Entomology, Bishop Museum, Honolulu. $10.50 soft cover.

This work treats 169 species in seven genera (four new) of Strongyliini from New Guinea. The work (in German), is formated as are standard taxonomic treatments. The taxa are profusely illustrated (each of the 79 numbered figures contains six to ten or more clear, informative line drawings). The full page plates (black and white) occasionally leave something to be desired, since the darker beetles are so devoid of detail many appear to be hardly more then silhouettes (see pl. VIII, Fig. A; XII, Fig. 1; etc). This would appear to be of a minimal disadvantage, however, in light of the numerous other drawings. Certain to be indespensible to future workers on the group. — ARH.

Pupation of *Hemerobius* in Douglas-fir Cones

(Neuroptera: Hemerobiidae)

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Hemerobiids are predators that attack aphidoids and coccidoids; some species are known to have voracious appetites (Killington, 1936), but North American species are usually considered uncommon (Smith, 1923) and thus presumably have a negligible effect on their host populations. Recently, Neuenshwander *et al.* (1975) has shown that one species, *Hemerobius pacificus* Banks, is sufficiently abundant to be a significant predator of aphids. In western North American *H. pacificus* is the most frequently encountered hemerobiid as it occurs on herbacious vegetation as well as on deciduous shrubs and trees. It now appears that other species of *Hemerobius* may also be abundant, but seldom seen because they remain in the crowns of conifers. With the discovery of a principle pupation site of hemerobiids in Douglas-fir *(Pseudotsuga menziesii)* it becomes possible to attempt sampling studies as well as obtain large numbers of specimens for other biological studies.

Records of pupation sites of North American hemerobiids consist of a few casual observations (Smith, 1923) that suggest that hemerobiids pupate in any small enclosed space such as a bark fissure or a curled leaf. Extensive records of pupation sites of European hemerobiids (Withycombe, 1922; Killington, 1936, 1937) indicate that arborial hemerobiids travel down the trunk of the tree seeking pupation sites and, in the absence of suitable bark fissures, pupate in moss and leaf litter at the base of the tree. Hemerobiids inhabiting Douglas-fir find in the Douglas-fir cone an idael pupation site adjacent to the larval feeding area.

Materials and Methods

During the winter of 1976-7 Douglas-fir cones were collected in Seattle city parks (Ravenna, Seward) and on the University of Washington campus. Most of the cones were gathered beneath mature trees. At several sites cones from previous years were removed from beneath the trees so that freshly fallen cones containing recently pupated hemerobiids could be easily gathered after wind-storms. Since hemerobiid cocoons remain concealed even in dry, fully open cones, it was necessary to dissect the cones scale by scale, using Crescent (942-5) wire cutters. The cocoons were removed from the cones and placed on a cone scale on a pad of paper toweling in 100 X 15 mm. Petri dishes. The Petri dishes were kept at room temperature and the paper toweling was moistened with a few drops of water every day.

The Pan-Pacific Entomologist 54:143-146. April 1978.

Results and Discussion

During this investigation 700 recently fallen cones were gathered at random beneath mature Douglas-fir trees. When dissected in the laboratory these cones produced a total of 1,038 hemerobiid cocoons, including 615 occupied cocoons, 372 empty cocoons, 51 parasitized cocoons; 11 active hemerobiid larvae were found. Many pupae and mature larvae were damaged when removed from the cones; 506 specimens were reared to maturity. The species obtained are discussed in the following annotated list.

Hemerobius stigmaterus Fitch.

Reared 223 females, 212 males, time required for emergence in laboratory 1-24 days; 92% emerged 5.20 days after brought into laboratory. Trees that are heavily infested with aphidoids, particularly *Adelges cooleyi* (Gillette) may have an average of more than one *H. stigmaterus* in each cone, indicating that *H. stigmaterus* may be an important predator.

Hemerobius pacificus Banks.

Reared 8 females, 7 males, time required for emergence in laboratory 5-22 days, 90% emerged 6-20 days after brought into laboratory. This species has a much broader habitat range than most hemerobiids; it is regularly found on conifers, broadleaf trees, and herbacious vegetation.

Hemerobius kokaneeanus Currie.

Reared 29 females, 24 males, time required for emergence in laboratory 2-22 days; 90% emerged 8-20 days after brought into laboratory. This relatively large series of a supposedly scarce species shows even more variation in wing markings than described by Carpenter (1940). Wing markings range from a small spot or row of spots on Cu_1 to light spots on all veins and to large dark blotches along Cu_1 and the inner and outer gradates. The amount of infuscation of the wing membrane is also highly variable and not correlated with the extensiveness of wing markings. A series of specimens shows a progressive lengthening of the blotches along Cu_1 and the outer gradates, culminating in a pair of specimens having the typical markings of *H. bistrigatus* Currie. Carpenter (1940) has already noted the remarkable similarity between the wing shape and genitalia of *H. kokaneeanus* and those of *H. bistrigatus;* this new evidence suggests that *H. kokaneeanus* may be a synonym of *H. bistrigatus.*

Hemerobius bistrigatus Currie

Reared 1 female, 1 male, time required for emergence in laboratory 20 days. This pair of specimens is discussed above under *H. kokaneeanus.*

Kimminsia coloradensis (Banks).

Reared 1 female, time required for emergence 14 days.

Douglas-fir cones make ideal sites for hemerobiid cocoons. Hemerobiids inhabiting Douglas-fir avoid the often lengthy and hazardous search for suitable bark crevices, many of which are already occupied by predators, particularly spiders. More predators undoubtedly await hemerobiids that are forced to pupate in leaf litter or moss. Douglas-fir cones, though occasionally inhabited by spiders, are poor habitats for large or mobil predators because the cones

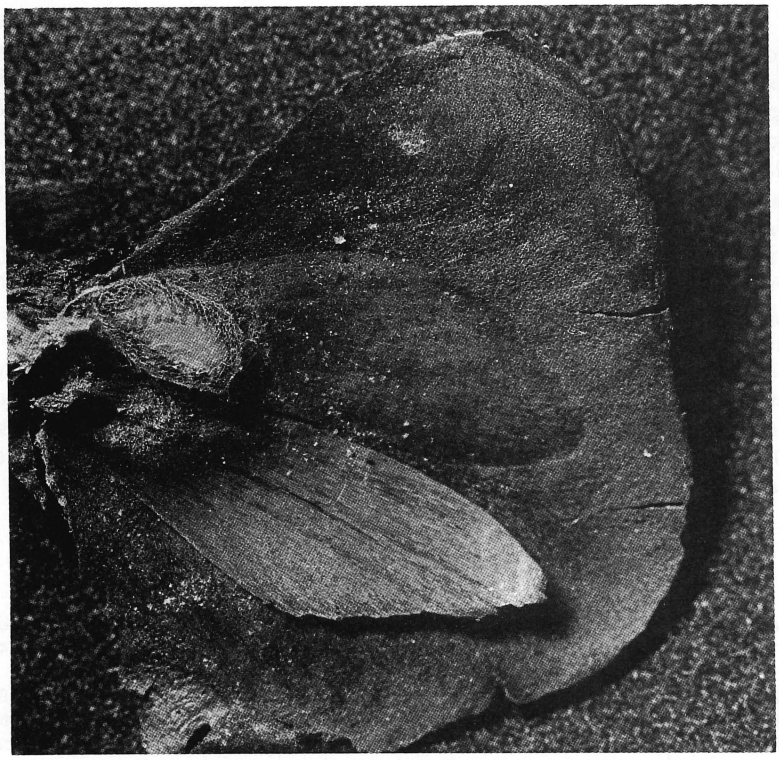

Fig. 1. Pupa of *Hemerobius* occupying depression left by fallen Douglas-fir seed. X 5.

close tightly during wet weather, leaving only a minute space at the base of each scale. The Douglas-fir seeds occupy a pair of depressions at the base of each cone scale; after the seeds fall each depression forms an oval hollow the size and shape of a hemerobiid cocoon. The hemerobiids show great constancy in choosing these hollows for pupation sites, even though the open cone during a period of dry weather offers a variety of apparently suitable crevices. Only a few larvae were found to have spun cocoons outside of the seed depressions; these larvae had been crushed by the closing of the cone during wet weather.

Although there are obvious mutually beneficial relationships between conifers and hemerobiids, it does not seem likely that the structure or mechanics of the Douglas-fir cone has been modified to provide shelter for hemerobiids. It is possible that hemerobiids in the Douglas-fir forests of western North America show behavioral adaptations that facilitate exploitation of Douglas-fir cones as pupation sites.

The abundance of Douglas-fir hemerobiids, and their dependable occurance in special pupation sites are factors that allow exploitation by a number of parasitoids. During the present study 8 species of hymenopterous parasitoids were reared from *Hemerobius* cocoons. There is one previous record of a parasitoid of Nearactic *Hemerobius* (Muesebeck *et al.*, 1951); there are also records of parasitoids of *Micromus* (Selhime and Kanavel, 1968) and *Symphorobius* (Muesebeck *et al.* 1951). Four of the parasitoids are ichneumonids of the genus *Charitopes:* these species oviposit on mature larvae within their cocoons and are obvious beneficiaries of the constancy with which hemerobiids choose their pupation sites within the Douglas-fir cone. Three other parasitoids are figitids, including one species of *Anacharis* and two species of *Aegilips;* these species presumably oviposit in larvae before the cocoon is spun. A few specimens of an unidentified ceraphronid were reared from *Hemerobius* cocoons. Only one parasitiod is produced per host, with the exception of the ceraphronid, a pair of which may emerge from a single host cocoon.

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Two New Genera of North American Incurvariine Moths

(Lepidoptera: Incurvariidae)

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Over the past several years I have devoted some effort to a systematic revision of the American moths of the family Incurvariidae, involving the subfamilies Incurvariinae, Prodoxinae, and Adelinae. During the course of these investigations, several new generic and specific taxa have been discovered. In order to validate two of these for inclusion in a forthcoming checklist of the *Moths of North America north of Mexico,* they are described now. The availability of these two generic names will make it possible to list all previously described North American species in a proposed phylogenetic sequence and with proper generic combinations.

As a means of clarifying the following generic descriptions, I have included illustrations of critical anatomical features of the type species of each new genus.

I wish to acknowledge Ms. Biruta Akerbergs, Mr. Andre Pizzini (deceased), and Mr. George Venable, staff artists of the Department of Entomology, for the illustrations used in this paper, and Mr. Victor Kranz of the Smithsonian Photographic Laboratory for his photographic assistance.

Tanysaccus, new genus

(Figures 1,3,5-6,9-12,17-18, and 20.)

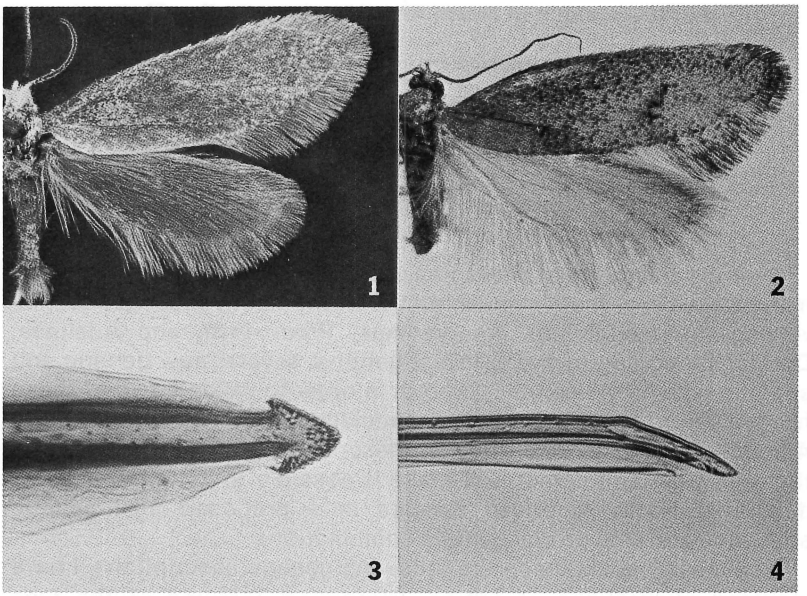
Type Species. — *Incurvaria aenescens* Wlsm., 1888.

Adult. — Small, slender-bodied moths with moderately slender wings; wing expanse 12-17 mm.

Head (Figures 5-6): Vestiture completely rough. Antennae 27-28 segmented, simple, approximately 0.45-0.55 the length of forewing; basal fourth to one-third of flagellum usually scaled dorsally; remainder of flagellum densely pubescent. Ocelli absent. Compound eyes relatively small, eye index[1] approximately 0.88-0.93; microtrichiae usually absent, sometimes present, scattered, variable in number; rarely exceeding diameter of a single facet in length. Mandibles present, but vestigial. Maxillary palpi elongate, slightly exceeding length of labial palpi, usually four-segmented, rarely with a minute, fifth segment at apex; terminal (fourth) segment longest, exceeding length of basal three segments combined. Galeae relatively short, slightly less than length of maxillary palpi. Labial palpi three-segmented, with second segment the longest and nearly twice the length of apical segment.

Thorax: Foretibiae with pectinate epiphysis at middle and extending about 0.6 the distance to apex. Forewings relatively narrow, greatest width approximately 0.32-0.34 the

[1] See Powell, 1973:8



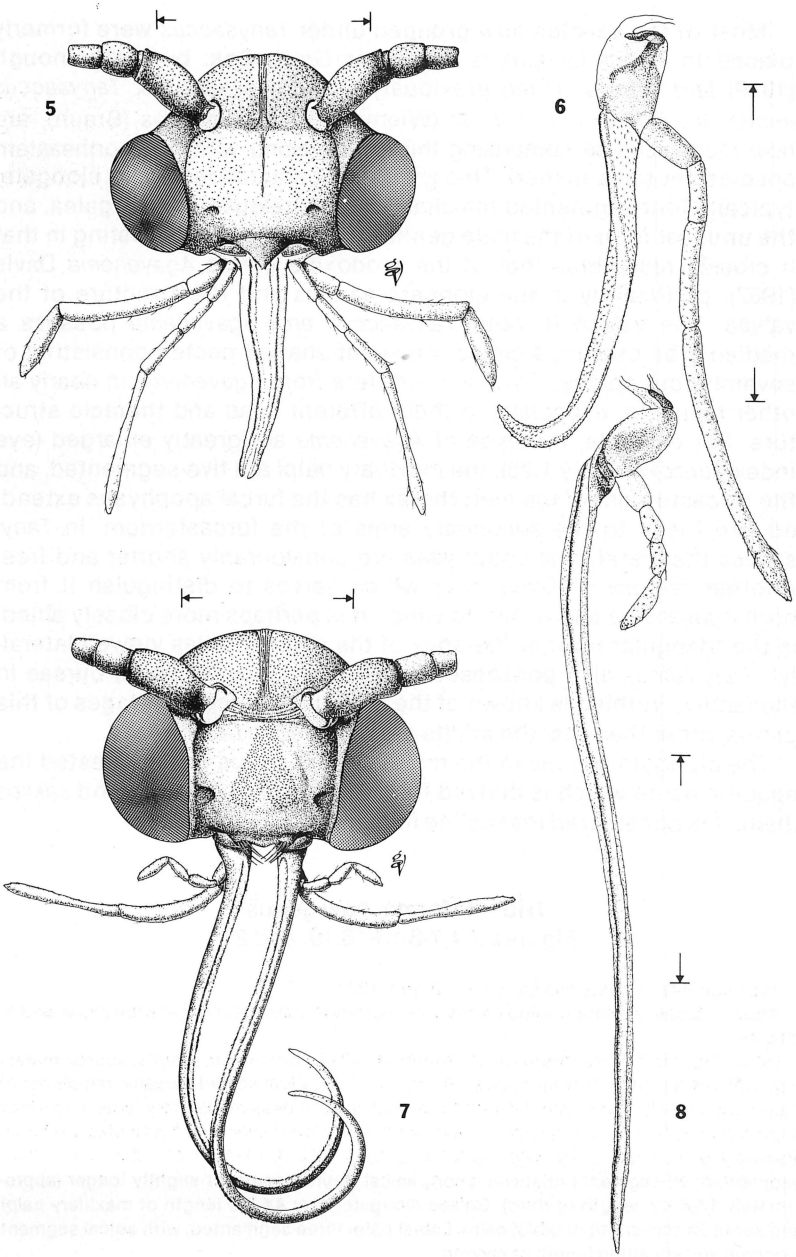
Figs. 1-4 Adult structure: Fig. 1, *Tanysaccus aenescens* (Wlsm.), male, Pullman, Wn., wing expanse 15 mm; Fig. 2, *Tridentaforma fuscoleuca* (Braun), male, Olympic Mts., Wn., wing expanse 15 mm.; Fig. 3, *Tanysaccus aenescens,* apex of female ovipositor; Fig. 4, *Tridentaforma fuscoleuca*, apex of female ovipositor.

length, with 10 veins from discal cell, occasionally with 9; R_4 and $_5$ variable, either separate, stalked, or completely fused; R_2 arising from apex of accessory cell approximate to R_3; Cu $_{1a}$ arising considerably closer to M_3 than to Cu $_{1b}$. Hindwings approximately same width as forewings, with 6 veins arising separate from cell; Cu $_{1b}$ arising from outer third of cell; base of medius forked within cell of both wings.

Abdomen: Unmodified, without specialized setal tufts or appendages. Seventh sternite of female moderately long, usually averaging 2.8-4.2 length of sixth. Eighth segment lightly and uniformly pigmented, without darkly sclerotized areas laterally.

Male genitalia (Figures 9-12): Uncus indistinct, reduced to a pair of small lobes. Vinculum and saccus Y-shaped, greatly lengthened, gradually constricting to a narrow, blunt end anteriorly; length approximately 2-3X as long as valvae. Valvae sharply constricted at middle, forming two portions; basal half broad, padlike; distal half slender with a prominent lobe bearing a single apical pecten of 6-20 spines. Juxta sharply divided into two distinct regions, a relatively broad, elongate caudal half and an extremely slender, rodlike anterior half. Aedeagus extremely long and slender, usually equalling length of entire genitalia, with a single, elongate, subapical cornutus.

Female genitalia (Figures 3, 17-18): Apex of ovipositor compressed, triangular (viewed laterally) with dorsal and ventral cutting edges serrulate and usually asymmetrical (i.e., of unequal lengths). Vestibulum typically very slender, without heavily thickened walls but usually with darkly pigmented areas posteriorly. Ductus bursae usually not thickened, extremely elongate, often more than 1.5 the length of posterior apophyses. A pair of stellate signa present; rays variable, usually slender but short and broad in *T. aenescens,* ranging in number between 4 and 15.



Figs. 5-8 Adult head structure: Figs. 5-6, *Tanysaccus aenescens*; Figs. 7-8, *Tridentaforma fuscoleuca*. (Scale = 0.5 mm.)

Most of the species now grouped under *Tanysaccus* were formerly placed in either *Lampronia* Steph. or *Greya* Bsk. by McDunnough (1939) and others. Three previously described species, *Tanysaccus aenescens* (Wlsm.), *T. humilis* (Wlsm.), and *T. sublustris* (Braun), are now recognized as comprising this genus along with one northeastern species yet to be named. This group is characterized by its elongate, typically four-segmented maxillary palpus, relatively short galea, and the unusual form of the male genitalia. The latter is interesting in that it closely resembles that of the prodoxine genus *Agavenema* Davis (1967), particularly in the elongate saccus and the structure of the valvae. The valvae in both *Tanysaccus* and *Agavenema* possess a median lobe bearing a single, crescent-shaped pecten consisting of several stout spines. *Tanysaccus* differs from *Agavenema* in nearly all other respects, especially in their different head and thoracic structure. For example, the eyes of *Agavenema* are greatly enlarged (eye index approximately 1.25), the maxillary palpi are five-segmented, and the furcasternum of the metathorax has the furcal apophyses extended and fused to the secondary arms of the furcasternum. In *Tanysaccus* the metafurcal apophyses are considerably shorter and free. Another feature of *Tanysaccus* which serves to distinguish it from both *Agavenema* and *Greya*, to which it is perhaps more closely allied, is the triangular form of the apex of the ovipositor (as viewed laterally). *Tanysaccus* also possesses one of the longest ductus bursae in the family. Nothing is known of the biology or immature stages of this genus, other than that the adults are believed to be diurnal.

The elongate saccus in the males of this genus has suggested the specific name which is derived from the Greek, *tany* (long) and *sakkos* (bag); it is considered masculine in gender.

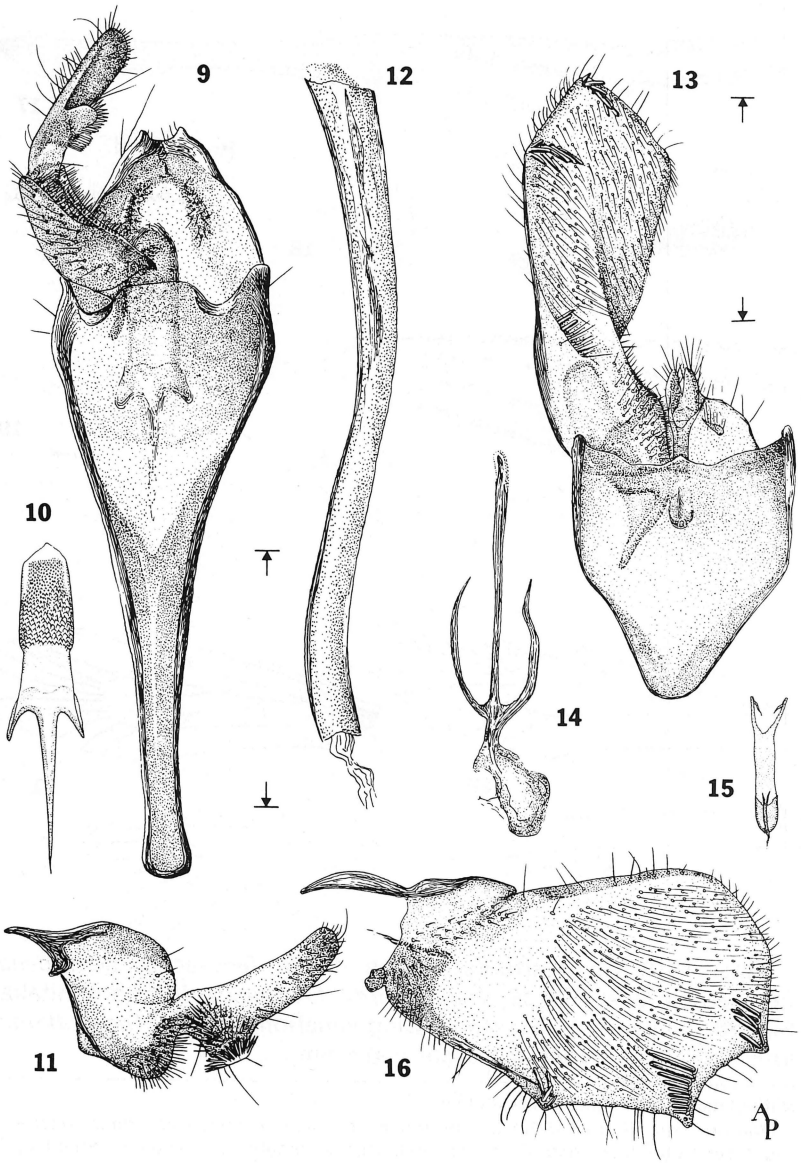
Tridentaforma, new genus
(Figures 2,4,7-8,13-16,19, and 21.)

Type species.—*Lampronia fuscoleuca* Braun, 1923

Adult.—Small, slender-bodied moths with moderately slender wings; wing expanse 8.5-20.5 mm.

Head (Figures 7-8): Vestiture rough. Antennae 40-49 segmented, simple, approximately 0.50-0.55 the length of forewing; basal 0.6 to 0.7 of flagellum scaled dorsally; remainder of flagellum densely pubescent. Ocelli absent. Compound eyes moderately large, eye index approximately 1.0-1.1; microtrichiae few, widely scattered over eye. Mandibles vestigial. Maxillary palpi moderately long, approximately 0.5-0.6 the length of labial palpi, four-segmented, all segments relatively short; apical (fourth) segment slightly longer (approximately 1.5X the length of third). Galeae elongate, over 4X the length of maxillary palpi and about 2X the length of labial palpi. Labial palpi three-segmented, with apical segment elongate and equalling length of second.

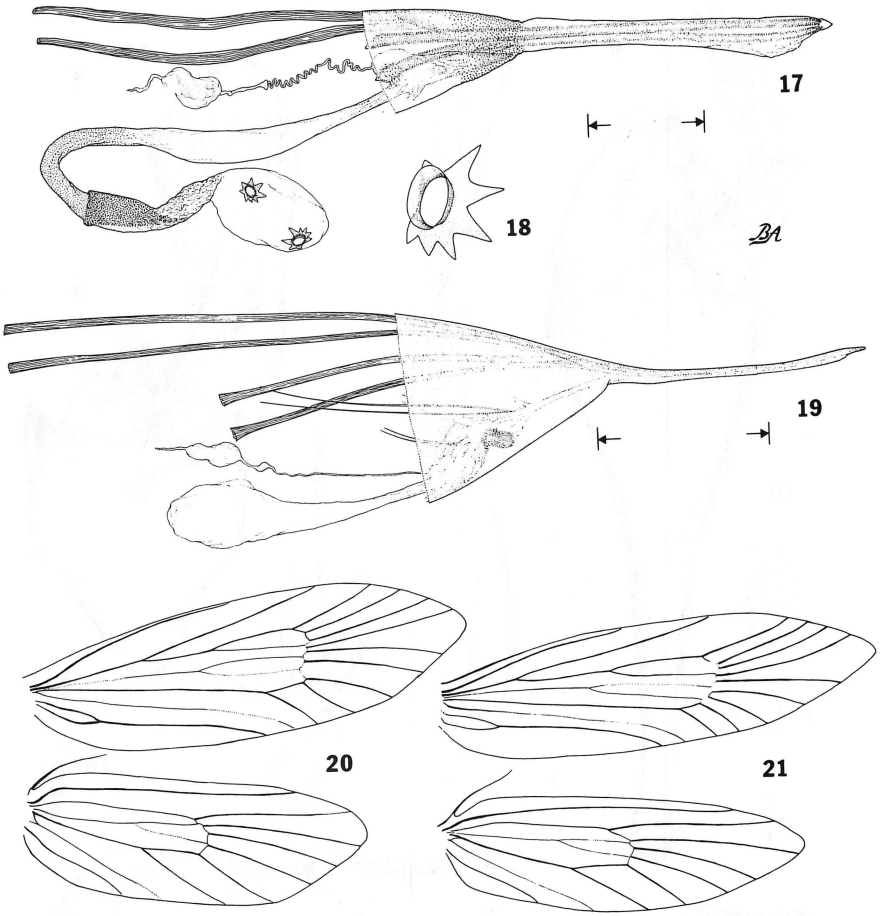
Thorax: Foretibiae with pectinate epiphysis from middle, extending approximately half way to apex. Forewings relatively narrow, greatest width about 3.4-3.6 length, with 10 veins arising usually separately from discal cell; R_1 arising near basal third of cell; R_2 from apex of accessory cell; R_3 rarely stalked with R_2; Cu_{1a} about equidistant from M_3



Figs. 9-16 Male genitalia: Figs. 9-12, *Tanysaccus aenescens*; Figs. 13-16, *Tridentaforma fuscoleuca*. (Scale = 0.5 mm.)

and Cu $_{1b}$ Hindwings approximately same width as forewings, with 6 veins from cell; M_1 and M_2 sometimes connate; Cu $_{1b}$ arising from outer third of cell; base of medius forked within cell of both wings.

Abdomen: Unmodified, without specialized setal tufts or appendages. Seventh sternite of female 2.4-2.8 the length of sixth. Eighth segment lightly and uniformly pigmented,



Figs. 17-21 Adult structure: Figs. 17-18, *Tanysaccus aenescens*, female genitalia; Fig. 19, *Tridentaforma fuscoleuca*, female genitalia; Fig. 20, *Tanysaccus aenescens,* wing venation; Fig. 21, *Tridentaforma fuscoleuca*, wing venation. (Scale = 0.5 mm.)

without darkly sclerotized areas laterally.

Male genitalia (Figures 13-16): Uncus reduced, consisting of two small lobes. Vinculum and saccus well developed, V- to Y-shaped, saccus sometimes attenuated; total length 0.6-1.3 the length of valvae. Valvae varying in width from relatively narrow to extremely broad; an equally spaced series of three pectens situated along ventral margin of valva, each pecten consisting of a short transverse row of 5-10 stout spines. Juxta moderately weak, and slender, gradually tapering anteriorly to an extremely slender, acute apex. Aedeagus three-branched with slender median branch the longest (approximately 2X the length of lateral branches) and containing the vesica; cornuti absent.

Female genitalia (Figures 4,19): Apex of ovipositor very slender, slightly compressed, acute, smooth, without a serrated cutting edge. Anterior and posterior apophyses extremely slender and elongate. Vestibulum relatively small and without heavily thickened

walls but with some sclerotization evident ventrally near posterior end. Ductus bursae membranous, relatively short, less than one-third the length of posterior apophyses. Corpus bursae entirely membranous, without signa.

Tridentiforma has been proposed for *fuscoleuca* Braun. Although only one species is included, considerable variation has been noted in the western populations and it is possible that a second, sibling species exists.

This genus may be distinguished from its nearest relatives, *Greya* and *Tanysaccus*, by the following combination of characters: the elongate galeae; the relatively short, typically four-segmented maxillary palpi; the trident-shaped aedeagus and tripectinated valvae of the male, and the elongate, slender ovipositor of the female.

The unusual form of the aedeagus, believed to be unique in the Incurvariidae, has suggested the name for this genus, which is derived from the Latin *tridens* (trident) and *forma* (form). The generic name is considered feminine in gender.

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Powell, J.A. 1973. A Systematic Monograph of New World Ethmiid Moths (Lepidoptera: Gelechioidea). Smithsonian Contributions to Zoology, No. 120.

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SCIENTIFIC NOTE

Some Notes on the Egg Sacs of *Aphonopelma chalcodes* (Araneae: Theraphosidae) — Two adult female tarantulas of the species *Aphonopelma chalcodes* Chamberlin produced egg sacs while kept in the laboratory. Both females were taken at Molino Basin, Pima County, Arizona. The first female made her egg sac on April 12, 1975, 241 days after she was captured. It was opened and contained 555 eggs. The second female formed her egg sac on March 1, 1976, 206 days after capture. This egg sac was kept at 23°-27°C in hopes that young would emerge. By 39 days mold became evident. The egg sac was then opened and found to contain 454 eggs. Many of these eggs had advanced to the deutova stage. Baerg (1958, The tarantula. University of Kansas Press, Lawrence, Kan. 88 pp.) found that the tarantula *Dugesiella hentzi* (Girard) produced 500-1000 eggs per egg sac and required 56 days in the laboratory before its young emerged from the egg sac. — EDWIN W. MINCH, *Department of Zoology, Arizona State University, Tempe, Arizona 85281.*

WALTER CARTER
1897-1977

Dr. Walter Carter, a distinguished entomologist in tropical agriculture, died November 26, 1977 in Walnut Creek, California. A native of Leeds, England, he was educated in British and Canadian schools, Montana State University (B.S. 1923), and the University of Minnesota (M.S. 1924; Ph.D. 1928). He began his career as an entomologist with the Bureau of Entomology, USDA at Twin Falls, Idaho in 1925, and in 1930 he became Head Entomologist of the Pineapple Producers Cooperative Association Experiment Station (later known as the Pineapple Research Institute) in Honolulu, Hawaii, a position he held until his retirement in 1962. Upon his retirement he was named Professor Emeritus at the University of Hawaii, where he had lectured to graduate students, and from 1969 until his death he was Visiting Scholar in the Department of Entomological Sciences, University of California, Berkeley.

Dr. Carter was probably best known for his work on mealybug wilt of pineapple, a complex plant disease involving toxic secretions of the mealybug and a transmissible latent factor. His research on this and other plant diseases related to insects culminated in publication of the book "Insects in Relation to Plant Disease" (second edition, 1973), considered *the* authoritative text on the subject. He wrote more than 90 scientific papers, published in a number of technical journals from 1925 to 1966, and contributed to chapters in the Yearbooks of Agriculture for 1952 and 1953 and in the Annual Review of Entomology for 1961.

Dr. Carter traveled extensively in the tropics in connection with his research on mealybug wilt, and as a consultant for the British Colonial Office and the United Nations on problems with tropical crops including cacao, tea, and coconut. He also served as Director of the USDA's Oriental Fruit Fly Investigations in Hawaii in 1949-1951, and as UNDP country representative in Jamaica in 1964-1965.

Dr. Walter Carter was an Honorary Member of the Entomological Society of America, and served as Chairman of the Pacific Branch of that society in 1956. He was also a member of the American Phytopathological Society, Sigma Xi, Hawaiian Academy of Science, the Northern California Entomology Club, and the Cosmos Club of Washington, D.C. He was the recipient of the C.W. Woodworth Award for Outstanding Achievement in Entomology in 1974, and the Distinguished Service Award of the University of Minnesota in 1961.

Dr. Carter is survived by his wife Minnie, sons Howard and Duncan, daughter Mrs. Marjorie Ackerman, sisters Winnie Paul of Eureka, California and Ada Haines of Leeds, England, nine grandchildren, and two great-grandchildren.

Ray F. Smith, University of California, Berkeley
D.G. Denning, Moraga, Calif.

The Pan-Pacific Entomologist 54:154. April 1978.

A Second Species of *Rothium,* An Intertidal Beetle from the Gulf of California

(Coleoptera: Staphylinidae)

Ian Moore

Division of Biological Control,
University of California, Riverside, California 92502.

The genus *Rothium,* along with its type species, was recently described (Moore and Legner, 1977) from a series of specimens taken from the rocky intertidal coast of northern Sonora, Mexico, in the Gulf of California. Fifteen specimens of a second species of this genus have since been collected in the same habitat on the seashore of the southern part of the Gulf of California in Sinaloa, Mexico. The second species closely resembles the first in size and color, but is quite different in the size of the eyes, length of the elytra and other body configurations.

Rothium giulianii, new species

Color: Dark testaceous with head, disc of pronotum, bases of elytra and bases of abdominal segments a little darker.

Head: Two-thirds wider than long; orbicular, with clypeal area somewhat produced; surface evenly convex, very finely and densely punctured and reticulate; pubescence short, dense, directed forward in front and outward at sides. Eyes not prominent, pubescent, about four times as long as tempora. Tempora rounded, not constricted behind. Antenna moderately incrassate, first segment a little more than twice as long as wide, second segment about as long and about as wide as first, segments three through seven very similar to second, but just perceptively decreasing in length, eighth through tenth noticeably decreasing in length and slightly increasing in width so that the tenth is slightly wider than long; eleventh segment ovoid, a little longer than wide.

Thorax: Pronotum subquadrate, about one-fourth wider than long, widest at apical fifth, apex gently arcuate, apical angles narrowly rounded, sides arcuate into the broadly rounded basal angles; base arcuate, about four-fifths as wide as apex; disc gently convex, sculpture and pubescence similar to that of head. Elytra conjointly about as wide as pronotum and about one-fourth longer; humeral angles broadly rounded, apical angles narrowly rounded; sculpture similar to that of head and pronotum, but with the pubescence directed posteriorly.

Abdomen: A little tapered to apex. Surface reticulate, sparsely pubescent. Fifth tergite with a polished tumid triangular area occupying about one-fourth of the apical margin and extending anteriorly about two-fifths of the length of the segment. Apex of sixth tergite with two prominent teeth separated by a deep arcuate emangination which occupies one-third of the width of the segment.

Length: 4.6 mm.

Holotype male: Mexico, Sinaloa, 4 miles north of Mazatlan, 25 April, 1974, intertidal rocks, Derham Giuliani collector.

Allotype female: Similar to holotype except that the elytra and first abdominal segment are somewhat paler; the surface of the fifth tergite is without a tumid central area and the apex of the sixth tergite is evenly arcuate. Same data as holotype.

Paratypes: Four ♂♂ and nine ♀♀, same data as holotype. The color of the paratypes is

The Pan-Pacific Entomologist 54:155-156. April 1978.

nearly uniform and the size variation is slight.

Disposition of Types: The holotype will be placed on permanent loan with the California Academy of Sciences in San Francisco. The allotype and paratypes are at present in the collection of the University of California at Riverside.

Notes: This species has a facies similar to that of *R. sonorensis* Moore and Legner, but is at once easily distinguished by the much larger eyes which occupy almost the entire side of the head whereas in *R. sonorensis* they occupy only one-half of the side of the head, by the elytra which are distinctly longer than the pronotum whereas in *R. sonorensis* they are about as long, and by the more elongate antennal segments with the tenth segment hardly wider than long whereas in *R. sonorensis* it is tranverse. The configuration of the fourth and fifth abdominal tergites of the male are quite different in the two species. The fifth tergite is unmodified in *R. sonorensis,* but has a tumid polished triangular area in *R. giulianii,* and the apical margin of the sixth tergite is provided with three large teeth in the former, but with only two large teeth in the latter.

This species is named for its collector, Derham Giuliani.

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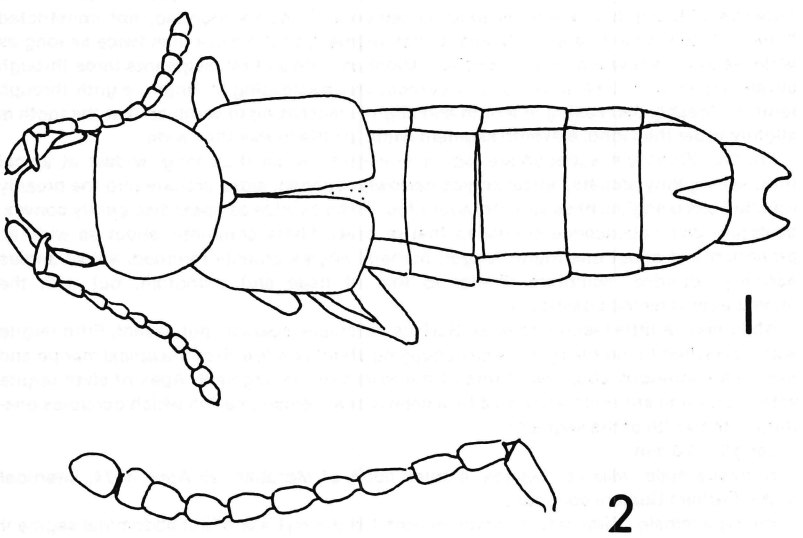
Moore, Ian and E. F. Legner. 1977. A report on some intertidal Staphylinidae from Sonora, Mexico, with four new genera (Coleoptera). Pacific Insects. 17:459-471, 20 Figs.



Figs. 1-2, *Rothium giulianii,* new species. Fig. 1, dorsal aspect. Fig. 2, antenna.

A New Species of *Pterotus* LeConte from California

(Coleoptera: Lampyridae)

John A. Chemsak

University of California, Berkeley

The genus *Pterotus* has contained a single species, *obscuripennis*, since LeConte proposed it in 1859. *P. obscuripennis* was described from Fort Tejon, California. It is known from southern Oregon to about El Rosario in northern Baja California.

The genus has been placed in the family Phengodidae and presently is considered a member of the Lampyridae. Its family affiliation may be resolved when females become known.

Celeste Green is gratefully acknowledged for preparing the illustrations.

Pterotus curticornis, new species

Male: Form moderate sized, depressed; integument orange, antennae brownish, elytra black. Head small, retractable, sparsely punctate and pubescent; antennae (Fig. 4) extend-

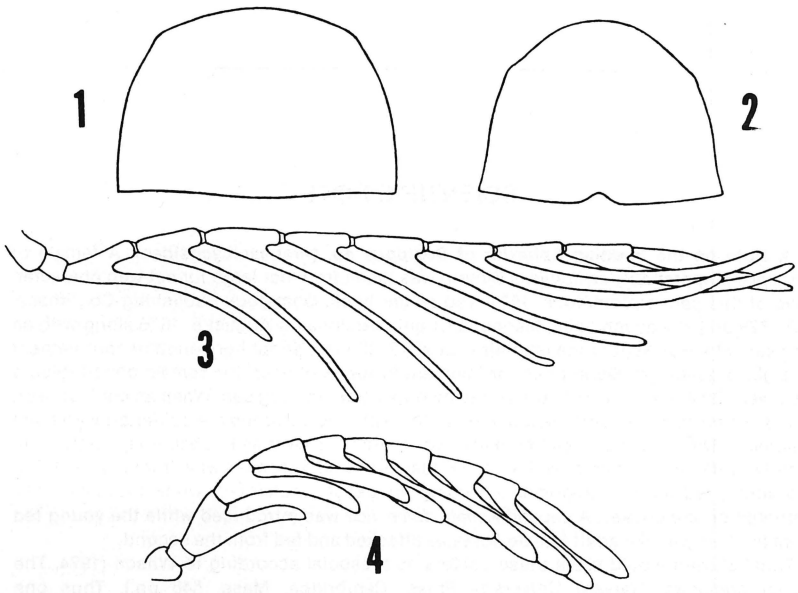


Fig. 1, Outline of pronotum of *Pterotus obscuripennis* LeConte, Fig. 2, outline of pronotum of *Pterotus curticornis* Chemsak, Fig. 3, antenna of *P. obscuripennis*, Fig. 4, antenna of *P. curticornis*.

The Pan-Pacific Entomologist 54:157-158. April 1978.

ing to about base of elytra, segments three to ten pectinate, apical extensions broad, no more than three times longer than segment, segments usually orange, extensions brown. Pronotum (Fig. 2) broader than long, lateral margins foliate; disk irregularly convex, delimited laterally by deep impressions, base narrowly impressed, emarginate at middle, median line narrow, extending from about apical one third almost to basal margin, punctures finer, shallow, subconfluent; pubescence short, rather sparse. Elytra about two and one half times as long as broad, sides shallowly emarginate at middle; each elytron with four costae; disk moderately coarsely, irregularly, reticulate-punctate; pubescence short, black, subdepressed; apices narrowly rounded. Legs slender, orange, tarsi reddish. Abdomen orange, moderately densely clothed with pale depressed pubescence. Length, 11-12 mm.

Holotype male (California Academy of Sciences) from Boyd Desert Research Center, 4 miles S Palm Desert, Riverside Co., California, 12 April, 1963, at light (C.A. Toschi). Three male paratypes, same data (J.A. Powell, R.L. Langston).

This species may be separated from *P. obscuripennis* by the shorter antennae with shorter, broader extensions. The segments are also broader. Additionally the pronotum is less broad in *curticornis* and the legs are orange and reddish and not infuscated.

Literature Cited

LeConte, J. L. 1859. Catalogue of the Coleoptera of Fort Tejon, California. Proc. Acad. Nat. Sci. Philadelphia 11:69-90.

SCIENTIFIC NOTE

A Note on the Feeding Behavior of *Sosippus* sp. (Araneae:Lycosidae). A female of *Sosippus* sp., probably *californicus* Simon, was taken from her large funnel web characteristic of this genus (Comstock, 1971, The spider book. Comstock Publishing Co., Ithaca, N.Y. 729 pp.) at Canyon Lake, Maricopa County, Arizona on August 8, 1976 along with an egg sac. She was kept in the laboratory at 23°-27°C throughout her period of confinement in a glass gallon jar. During her confinement in the container, the female constructed a new web. On August 11, 1976 the young emerged from the egg sac. When an adult cricket, *Acheta domestica* Linnaeus, was placed in the web, the adult female spider attacked and quieted it. Then the young gathered and fed in such numbers as to obscure the prey completely, while the mother moved off and remained some distance away. It was evident that the young fed as their abdomens became noticeably distended, while they remained gathered on the cricket. A second *Acheta domestica* was introduced while the young fed from the first, and the adult female *Sosippus* attacked and fed from the second.

This behavior would class these spiders as presocial according to Wilson (1974, The insect societies, Harvard University Press, Cambridge, Mass. 548 pp.). Thus one additional family should be added to his list of spider families containing species exhibiting precursors of social behavior. EDWIN W. MINCH, *Arizona State University, Tempe 85281.*

Homonymy of *Macropia*

(Diptera: Tachinidae; Lepidoptera: Choreutidae)[1]

John B. Heppner[2]

Dept. Entomology and Nematology, IFAS, University of Florida, Gainesville

The generic name *Macropia* Costa, [1836], was proposed as a subgenus in the introductory discussion to the genus *Asopia* (treated as a subgenus of *Pyralis*) in the Lepidoptera part of his work on the fauna of Naples, Italy (Costa, [1836]-1850), for the species of section B of Treitschke's (1829) treatment of *Asopia*. Costa did not list any species of *Macropia* but only noted that all the species of Treitschke's *Asopia* section B belonged in the new subgenus. Treitschke (1829) included the following species in section B of *Asopia,* numbered 9-12, currently in Choreutidae except for #9 (species 1-8 were included in section A and are now in Pyralidae): 9) *Asopia nemoralis* (Hübner) [now in Pyralidae]; 10) *Asopia incisalis* Treitschke [= *Eutromula nemorana* (Hübner)]; 11) *Asopia parialis* Treitschke [= *Eutromula pariana* (Clerck)]; and 12) *Asopia alternalis* Treitschke [= *Anthophila fabriciana* (Linnaeus)].

Macropia Costa was subsequently mentioned by Zeller (1847), who noted that it was a synonym of *Choreutis* Hübner (Choreutidae) and placed all the choreutid species of Treitschke's *Asopia* section B into one genus, *Choreutis*. Since 1847 *Macropia* Costa has remained forgotten and, in fact, has never been included in any other work, list, catalog, or generic nomenclator. Although Zeller (1847) mentioned species now retained in *Choreutis*, the three choreutid species included by Treitschke (1829) in his section B of *Asopia* are currently assigned to other genera, as noted above. *Macropia* Costa cannot, therefore, be considered a synonym of *Choreutis*. No type-species has been designated for *Macropia* Costa. Inasmuch as both Treitschke and Zeller begin their listing of the original 4 species with *Asopia incisalis* (now known as *Eutromula nemorana*), I hereby designate *Asopia incisalis* Treitschke, 1829, as the type-species of *Macropia* Costa. Consequently, *Macropia* Costa, [1836] becomes a junior subjective synonym of *Eutromula* Frölich, 1828.

Macropia Malloch, 1930 (Diptera: Tachinidae), described for a species of tachinid from Australia, is a junior homonym of *Macropia* Costa, [1836]. Since homonymy is involved, *Macropia* Costa cannot be considered a *nomen oblitum*, which it otherwise would be. *Macropia* Malloch, 1930, is now considered to be a junior synonym of *Halydaia*

[1]Florida Agricultural Experiment Station Journal Series No. 916.

[2]Mail address: Dept. of Entomology, Smithsonian Institution, Washington, D.C. 20560.

The Pan-Pacific Entomologist 54:159-160. April 1978.

Egger, 1856, and, thus, does not require a new name.

C.W. Sabrosky (USNM) kindly helped in determining the current status of *Macropia* Malloch in Tachinidae.

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Costa, O.-G. [1836]-1850. Lepidotteri. *In*, Fauna del regno di Napoli. . . . Torchi, Naples. [442 pp.] (*Asopia* section, 2 pp. [p. 196-197 (Direction 59)] [1836]).

Malloch, J.R. 1930. Notes on Australian Diptera. XXIV. Proc. Linn. Soc. N.S.W. 55:303-353.

Treitschke, F. 1829. Zünsler. G. *Herminia-Ennychia. In*, F. Ochsenheimer, Die Schmetterlinge von Europa. Siebenter Band [7]. Fleischer, Leipzig. 252 pp.

Zeller, P.C. 1847. Bemerkungen über die auf einer Reise nach Italien und Sicilien beobachteten Schmetterlingsarten. VII. Isis von Oken 40:641-673.

Zoological Nomenclature

The following Opinions (listed by number) have been published recently by the International Commission on Zoological Nomenclature (see *Bulletin Zoological Nomenclature* Volume 34, part 4, 28 February, 1978).

Opinion No.

1100 (p. 203) Designation of *Musca frit* Linnaeus, 1758, as type-species of *Oscinella* Becker, 1909 (Diptera CHLOROPIDAE).

1103 (p. 218) Suppression of nine specific names in the family TETRIGIDAE (Insecta, Orthoptera).

1105 (p. 234) Designation of a type-species for *Lonomia* Walker, 1855 (Insecta, Lepidoptera).

1106 (p. 237) Conservation of the generic name *Rhopalum* Stephens, 1829 (Insecta, Hymenoptera).

The Commission cannot supply separates of Opinions.

January issue mailed April 26, 1978

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Essig, E.O. 1926. A butterfly migration. Pan-Pac. Entomol., 2:211-212.
Essig, E.O. 1958. Insects and mites of western North America. Rev. ed. The Macmillan Co., New York, 1050 pp.

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